OM-253 906D 2012–08

Processes

- MIG (GMAW) and Pulsed MIG (GMAW-P) Welding
- TIG (GTAW) Welding
- Flux Cored (FCAW) Welding
- Stick (SMAW) Welding
- Multiprocess Welding

Description

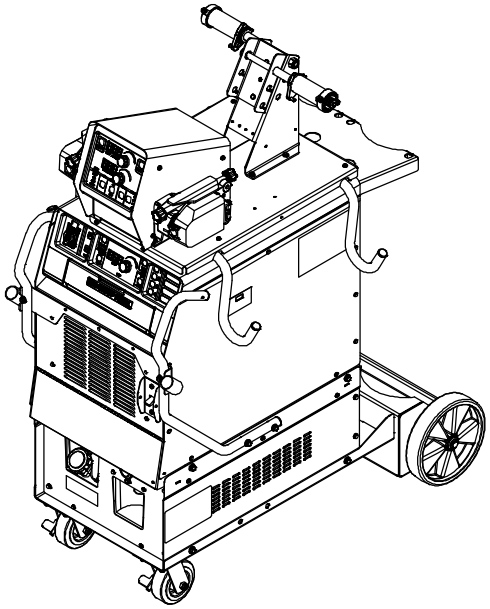
Arc Welding Power Source

Wire Feeder

PipeWorx 400 Welding System

(380-400 Volt Model)

CE



OWNER'S MANUAL

File: MIG (GMAW)

Visit our website at

www.MillerWelds.com

From Miller to You

Thank you and *congratulations* on choosing Miller. Now you can get the job done and get it done right. We know you don't have time to do it any other way.

That's why when Niels Miller first started building arc welders in 1929, he made sure his products offered long-lasting value and superior quality. Like you, his customers couldn't afford anything less. Miller products had to be more than the best they could be. They had to be the best you could buy.

Today, the people that build and sell Miller products continue the tradition. They're just as committed to providing equipment and service that meets the high standards of quality and value established in 1929.

This Owner's Manual is designed to help you get the most out of your Miller products. Please take time to read the Safety precautions. They will help you protect yourself against potential hazards on the worksite.

ISO 9001 REGISTERED QUALITY SYSTEM

Miller is the first welding equipment manufacturer in the U.S.A. to be registered to the ISO 9001:2000 Quality System Standard.

We've made installation and operation quick and easy. With Miller you can count on years of reliable service with proper maintenance. And if for some reason the unit needs repair, there's a Troubleshooting section that will help you figure out what the problem is. The parts list will then help you to decide the exact part you may need to fix the problem. Warranty and service information for your particular model are also provided.

Miller Electric manufactures a full line of welders and welding related equipment. For information on other quality Miller products, contact your local Miller distributor to receive the latest full line catalog or individual specification sheets. **To locate your nearest distributor or service agency call 1-800-4-A-Miller, or visit us at www.MillerWelds.com on the web.**

TRUE BLUE® WARRANTY

Working as hard as you do – every power source from Miller is backed by the most hassle-free warranty in the business.

Miller®

DECLARATION OF CONFORMITY

for European Community (CE marked) products.

MILLER Electric Mfg. Co., 1635 Spencer Street, Appleton, WI 54914 U.S.A. declares that the product(s) identified in this declaration conform to the essential requirements and provisions of the stated Council Directive(s) and Standard(s).

Product/Apparatus Identification:

Product	Stock Number
PIPEWORX 400 (380-400V) CE	907534
PIPEWORX SINGLE FEEDER	300949
PIPEWORX DUAL FEEDER	300950

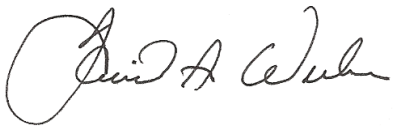
Council Directives:

- 2006/95/EC Low Voltage
- 2004/108/EC Electromagnetic Compatibility

Standards:

- IEC 60974-1:2005 Arc welding equipment – Part 1: Welding power sources
- IEC 60974-3: 2007 Arc Welding Equipment – Arc Striking and Stabilizing Devices
- IEC 60974-5:2007 Arc welding equipment – Part 5: Wire feeders
- IEC 60974-10:2007 Arc Welding Equipment – Part 10: Electromagnetic compatibility (EMC) requirements
- EN 50445:2008 Product family standard to demonstrate compliance of equipment for resistance welding, arc welding and allied processes with the basic restrictions related to human exposure to electromagnetic fields (0 Hz – 300Hz)

Signatory:



December 5, 2011

David A. Werba

MANAGER, PRODUCT DESIGN COMPLIANCE

Date of Declaration

255729A

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SECTION 1 – SAFETY PRECAUTIONS - READ BEFORE USING

Protect yourself and others from injury — read, follow, and save these important safety precautions and operating instructions.

1-1. Symbol Usage

DANGER! – Indicates a hazardous situation which, if not avoided, will result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

Indicates a hazardous situation which, if not avoided, could result in death or serious injury. The possible hazards are shown in the adjoining symbols or explained in the text.

NOTICE *– Indicates statements not related to personal injury.*

☞ *Indicates special instructions.*

This group of symbols means Warning! Watch Out! ELECTRIC SHOCK, MOVING PARTS, and HOT PARTS hazards. Consult symbols and related instructions below for necessary actions to avoid the hazards.

1-2. Arc Welding Hazards

The symbols shown below are used throughout this manual to call attention to and identify possible hazards. When you see the symbol, watch out, and follow the related instructions to avoid the hazard. The safety information given below is only a summary of the more complete safety information found in the Safety Standards listed in Section 1-5. Read and follow all Safety Standards.

Only qualified persons should install, operate, maintain, and repair this unit.

During operation, keep everybody, especially children, away.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

- Do not touch live electrical parts.
- Wear dry, hole-free insulating gloves and body protection.
- Insulate yourself from work and ground using dry insulating mats or covers big enough to prevent any physical contact with the work or ground.
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control if present on unit.
- Additional safety precautions are required when any of the following electrically hazardous conditions are present: in damp locations or while wearing wet clothing; on metal structures such as floors, gratings, or scaffolds; when in cramped positions such as sitting, kneeling, or lying; or when there is a high risk of unavoidable or accidental contact with the workpiece or ground. For these conditions, use the following equipment in order presented: 1) a semiautomatic DC constant voltage (wire) welder, 2) a DC manual (stick) welder, or 3) an AC welder with reduced open-circuit voltage. In most situations, use of a DC, constant voltage wire welder is recommended. And, do not work alone!
- Disconnect input power or stop engine before installing or servicing this equipment. Lockout/tagout input power according to OSHA 29 CFR 1910.147 (see Safety Standards).
- Properly install, ground, and operate this equipment according to its Owner's Manual and national, state, and local codes.
- Always verify the supply ground – check and be sure that input power cord ground wire is properly connected to ground terminal in disconnect box or that cord plug is connected to a properly grounded receptacle outlet.
- When making input connections, attach proper grounding conductor first – double-check connections.
- Keep cords dry, free of oil and grease, and protected from hot metal and sparks.
- Frequently inspect input power cord for damage or bare wiring – replace cord immediately if damaged – bare wiring can kill.
- Turn off all equipment when not in use.
- Do not use worn, damaged, undersized, or poorly spliced cables.
- Do not drape cables over your body.
- If earth grounding of the workpiece is required, ground it directly with a separate cable.
- Do not touch electrode if you are in contact with the work, ground, or another electrode from a different machine.
- Do not touch electrode holders connected to two welding machines at the same time since double open-circuit voltage will be present.
- Use only well-maintained equipment. Repair or replace damaged parts at once. Maintain unit according to manual.
- Wear a safety harness if working above floor level.
- Keep all panels and covers securely in place.
- Clamp work cable with good metal-to-metal contact to workpiece or worktable as near the weld as practical.
- Insulate work clamp when not connected to workpiece to prevent contact with any metal object.
- Do not connect more than one electrode or work cable to any single weld output terminal. Disconnect cable for process not in use.

SIGNIFICANT DC VOLTAGE exists in inverter welding power sources AFTER removal of input power.

- Turn Off inverter, disconnect input power, and discharge input capacitors according to instructions in Maintenance Section before touching any parts.

HOT PARTS can burn.

- Do not touch hot parts bare handed.
- Allow cooling period before working on equipment.
- To handle hot parts, use proper tools and/or wear heavy, insulated welding gloves and clothing to prevent burns.

FUMES AND GASES can be hazardous.

Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

- Keep your head out of the fumes. Do not breathe the fumes.
- If inside, ventilate the area and/or use local forced ventilation at the arc to remove welding fumes and gases.
- If ventilation is poor, wear an approved air-supplied respirator.
- Read and understand the Material Safety Data Sheets (MSDSs) and the manufacturer's instructions for metals, consumables, coatings, cleaners, and degreasers.
- Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Always have a trained watch-person nearby. Welding fumes and gases can displace air and lower the oxygen level causing injury or death. Be sure the breathing air is safe.
- Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
- Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

ARC RAYS can burn eyes and skin.

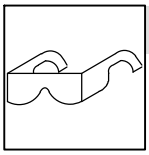
Arc rays from the welding process produce intense visible and invisible (ultraviolet and infrared) rays that can burn eyes and skin. Sparks fly off from the weld.

- Wear an approved welding helmet fitted with a proper shade of filter lenses to protect your face and eyes from arc rays and sparks when welding or watching (see ANSI Z49.1 and Z87.1 listed in Safety Standards).
- Wear approved safety glasses with side shields under your helmet.
- Use protective screens or barriers to protect others from flash, glare and sparks; warn others not to watch the arc.
- Wear protective clothing made from durable, flame-resistant material (leather, heavy cotton, or wool) and foot protection.

WELDING can cause fire or explosion.

Welding on closed containers, such as tanks, drums, or pipes, can cause them to blow up. Sparks can fly off from the welding arc. The flying sparks, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode to metal objects can cause sparks, explosion, overheating, or fire. Check and be sure the area is safe before doing any welding.

- Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
- Do not weld where flying sparks can strike flammable material.
- Protect yourself and others from flying sparks and hot metal.
- Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
- Watch for fire, and keep a fire extinguisher nearby.
- Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
- Do not weld on containers that have held combustibles, or on closed containers such as tanks, drums, or pipes unless they are properly prepared according to AWS F4.1 and AWS A6.0 (see Safety Standards).
- Do not weld where the atmosphere may contain flammable dust, gas, or liquid vapors (such as gasoline).
- Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock, sparks, and fire hazards.
- Do not use welder to thaw frozen pipes.
- Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
- Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.
- Remove any combustibles, such as a butane lighter or matches, from your person before doing any welding.
- After completion of work, inspect area to ensure it is free of sparks, glowing embers, and flames.
- Use only correct fuses or circuit breakers. Do not oversize or by-pass them.
- Follow requirements in OSHA 1910.252 (a) (2) (iv) and NFPA 51B for hot work and have a fire watcher and extinguisher nearby.



FLYING METAL or DIRT can injure eyes.

- Welding, chipping, wire brushing, and grinding cause sparks and flying metal. As welds cool, they can throw off slag.
- Wear approved safety glasses with side shields even under your welding helmet.

BUILDUP OF GAS can injure or kill.

- Shut off compressed gas supply when not in use.
- Always ventilate confined spaces or use approved air-supplied respirator.

ELECTRIC AND MAGNETIC FIELDS (EMF) can affect Implanted Medical Devices.

- Wearers of Pacemakers and other Implanted Medical Devices should keep away.
- Implanted Medical Device wearers should consult their doctor and the device manufacturer before going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations.

NOISE can damage hearing.

Noise from some processes or equipment can damage hearing.

- Wear approved ear protection if noise level is high.

CYLINDERS can explode if damaged.

Compressed gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

- Protect compressed gas cylinders from excessive heat, mechanical shocks, physical damage, slag, open flames, sparks, and arcs.
- Install cylinders in an upright position by securing to a stationary support or cylinder rack to prevent falling or tipping.
- Keep cylinders away from any welding or other electrical circuits.
- Never drape a welding torch over a gas cylinder.
- Never allow a welding electrode to touch any cylinder.
- Never weld on a pressurized cylinder – explosion will result.
- Use only correct compressed gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
- Turn face away from valve outlet when opening cylinder valve.
- Keep protective cap in place over valve except when cylinder is in use or connected for use.
- Use the right equipment, correct procedures, and sufficient number of persons to lift and move cylinders.
- Read and follow instructions on compressed gas cylinders, associated equipment, and Compressed Gas Association (CGA) publication P-1 listed in Safety Standards.

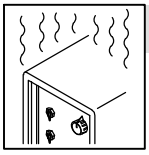
1-3. Additional Symbols For Installation, Operation, And Maintenance

FIRE OR EXPLOSION hazard.

- Do not install or place unit on, over, or near combustible surfaces.
- Do not install unit near flammables.
- Do not overload building wiring – be sure power supply system is properly sized, rated, and protected to handle this unit.

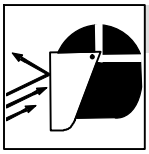
FALLING EQUIPMENT can injure.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift and support unit.
- If using lift forks to move unit, be sure forks are long enough to extend beyond opposite side of unit.
- Keep equipment (cables and cords) away from moving vehicles when working from an aerial location.
- Follow the guidelines in the Applications Manual for the Revised NIOSH Lifting Equation (Publication No. 94–110) when manually lifting heavy parts or equipment.



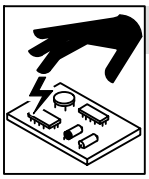
OVERUSE can cause OVERHEATING

- Allow cooling period; follow rated duty cycle.
- Reduce current or reduce duty cycle before starting to weld again.
- Do not block or filter airflow to unit.



FLYING SPARKS can injure.

- Wear a face shield to protect eyes and face.
- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Sparks can cause fires — keep flammables away.



STATIC (ESD) can damage PC boards.

- Put on grounded wrist strap BEFORE handling boards or parts.
- Use proper static-proof bags and boxes to store, move, or ship PC boards.

MOVING PARTS can injure.

- Keep away from moving parts.
- Keep away from pinch points such as drive rolls.

WELDING WIRE can injure.

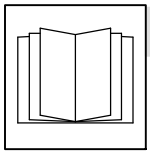
- Do not press gun trigger until instructed to do so.
- Do not point gun toward any part of the body, other people, or any metal when threading welding wire.

BATTERY EXPLOSION can injure.

- Do not use welder to charge batteries or jump start vehicles unless it has a battery charging feature designed for this purpose.

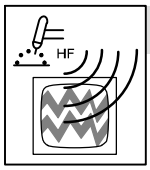
MOVING PARTS can injure.

- Keep away from moving parts such as fans.
- Keep all doors, panels, covers, and guards closed and securely in place.
- Have only qualified persons remove doors, panels, covers, or guards for maintenance and troubleshooting as necessary.
- Reinstall doors, panels, covers, or guards when maintenance is finished and before reconnecting input power.



READ INSTRUCTIONS.

- Read and follow all labels and the Owner's Manual carefully before installing, operating, or servicing unit. Read the safety information at the beginning of the manual and in each section.
- Use only genuine replacement parts from the manufacturer.
- Perform maintenance and service according to the Owner's Manuals, industry standards, and national, state, and local codes.



H.F. RADIATION can cause interference.

- High-frequency (H.F.) can interfere with radio navigation, safety services, computers, and communications equipment.
- Have only qualified persons familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding to minimize the possibility of interference.

ARC WELDING can cause interference.

- Electromagnetic energy can interfere with sensitive electronic equipment such as computers and computer-driven equipment such as robots.
- Be sure all equipment in the welding area is electromagnetically compatible.
- To reduce possible interference, keep weld cables as short as possible, close together, and down low, such as on the floor.
- Locate welding operation 100 meters from any sensitive electronic equipment.
- Be sure this welding machine is installed and grounded according to this manual.
- If interference still occurs, the user must take extra measures such as moving the welding machine, using shielded cables, using line filters, or shielding the work area.

1-4. California Proposition 65 Warnings

Welding or cutting equipment produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code Section 25249.5 et seq.)

This product contains chemicals, including lead, known to the state of California to cause cancer, birth defects, or other reproductive harm. *Wash hands after use.*

1-5. Principal Safety Standards

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, is available as a free download from the American Welding Society at http://www.aws.org or purchased from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for Welding and Cutting Containers that have Held Combustibles, American Welding Society Standard AWS A6.0, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www. sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website:www.cganet.com).

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org.

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

1-6. EMF Information

Electric current flowing through any conductor causes localized electric and magnetic fields (EMF). Welding current creates an EMF field around the welding circuit and welding equipment. EMF fields may interfere with some medical implants, e.g. pacemakers. Protective measures for persons wearing medical implants have to be taken. For example, restrict access for passers–by or conduct individual risk assessment for welders. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

1. Keep cables close together by twisting or taping them, or using a cable cover.
2. Do not place your body between welding cables. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around your body.
4. Keep head and trunk as far away from the equipment in the welding circuit as possible.
5. Connect work clamp to workpiece as close to the weld as possible.
6. Do not work next to, sit or lean on the welding power source.
7. Do not weld whilst carrying the welding power source or wire feeder.

About Implanted Medical Devices:

Implanted Medical Device wearers should consult their doctor and the device manufacturer before performing or going near arc welding, spot welding, gouging, plasma arc cutting, or induction heating operations. If cleared by your doctor, then following the above procedures is recommended.

SECTION 2 – CONSIGNES DE SÉCURITÉ – LIRE AVANT UTILISATION

Pour écarter les risques de blessure pour vous–même et pour autrui — lire, appliquer et ranger en lieu sûr ces consignes relatives aux précautions de sécurité et au mode opératoire.

2-1. Symboles utilisés

DANGER! – Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

Indique une situation dangereuse qui si on l'évite pas peut donner la mort ou des blessures graves. Les dangers possibles sont montrés par les symboles joints ou sont expliqués dans le texte.

***NOTE** – Indique des déclarations pas en relation avec des blessures personnelles.*

☞ *Indique des instructions spécifiques.*

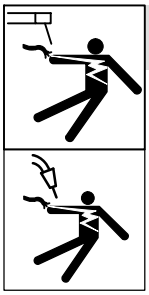
Ce groupe de symboles veut dire Avertissement! Attention! DANGER DE CHOC ELECTRIQUE, PIECES EN MOUVEMENT, et PIECES CHAUDES. Consulter les symboles et les instructions ci-dessous y afférant pour les actions nécessaires afin d'éviter le danger.

2-2. Dangers relatifs au soudage à l'arc

Les symboles représentés ci-dessous sont utilisés dans ce manuel pour attirer l'attention et identifier les dangers possibles. En présence de l'un de ces symboles, prendre garde et suivre les instructions afférentes pour éviter tout risque. Les instructions en matière de sécurité indiquées ci-dessous ne constituent qu'un sommaire des instructions de sécurité plus complètes fournies dans les normes de sécurité énumérées dans la Section 2-5. Lire et observer toutes les normes de sécurité.

Seul un personnel qualifié est autorisé à installer, faire fonctionner, entretenir et réparer cet appareil.

Pendant le fonctionnement, maintenir à distance toutes les personnes, notamment les enfants de l'appareil.



UNE DÉCHARGE ÉLECTRIQUE peut entraîner la mort.

Le contact d'organes électriques sous tension peut provoquer des accidents mortels ou des brûlures graves. Le circuit de l'électrode et de la pièce est sous tension lorsque le courant est délivré à la sortie. Le circuit d'alimentation et les circuits internes de la machine sont également sous tension lorsque l'alimentation est sur Marche. Dans le mode de soudage avec du fil, le fil, le dérouleur, le bloc de commande du rouleau et toutes les parties métalliques en contact avec le fil sont sous tension électrique. Un équipement installé ou mis à la terre de manière incorrecte ou impropre constitue un danger.

- Ne pas toucher aux pièces électriques sous tension.
- Porter des gants isolants et des vêtements de protection secs et sans trous.
- S'isoler de la pièce à couper et du sol en utilisant des housses ou des tapis assez grands afin d'éviter tout contact physique avec la pièce à couper ou le sol.
- Ne pas se servir de source électrique à courant électrique dans les zones humides, dans les endroits confinés ou là où on risque de tomber.
- Se servir d'une source électrique à courant électrique UNIQUEMENT si le procédé de soudage le demande.
- Si l'utilisation d'une source électrique à courant électrique s'avère nécessaire, se servir de la fonction de télécommande si l'appareil en est équipé.
- D'autres consignes de sécurité sont nécessaires dans les conditions suivantes : risques électriques dans un environnement humide ou si l'on porte des vêtements mouillés ; sur des structures métalliques telles que sols, grilles ou échafaudages ; en position coincée comme assise, à genoux ou couchée ; ou s'il y a un risque élevé de contact inévitable ou accidentel avec la pièce à souder ou le sol. Dans ces conditions, utiliser les équipements suivants, dans l'ordre indiqué : 1) un poste à souder DC à tension constante (à fil), 2) un poste à souder DC manuel (électrode) ou 3) un poste à souder AC à tension à vide réduite. Dans la plupart des situations, l'utilisation d'un poste à souder DC à fil à tension constante est recommandée. En outre, ne pas travailler seul !
- Couper l'alimentation ou arrêter le moteur avant de procéder à l'installation, à la réparation ou à l'entretien de l'appareil. Déverrouiller l'alimentation selon la norme OSHA 29 CFR 1910.147 (voir normes de sécurité).
- Installez, mettez à la terre et utilisez correctement cet équipement conformément à son Manuel d'Utilisation et aux réglementations nationales, gouvernementales et locales.
- Toujours vérifier la terre du cordon d'alimentation. Vérifier et s'assurer que le fil de terre du cordon d'alimentation est bien raccordé à la borne de terre du sectionneur ou que la fiche du cordon est raccordée à une prise correctement mise à la terre.
- En effectuant les raccordements d'entrée, fixer d'abord le conducteur de mise à la terre approprié et contre-vérifier les connexions.
- Les câbles doivent être exempts d'humidité, d'huile et de graisse; protégez–les contre les étincelles et les pièces métalliques chaudes.
- Vérifier fréquemment le cordon d'alimentation afin de s'assurer qu'il n'est pas altéré ou à nu, le remplacer immédiatement s'il l'est. Un fil à nu peut entraîner la mort.
- L'équipement doit être hors tension lorsqu'il n'est pas utilisé.
- Ne pas utiliser des câbles usés, endommagés, de grosseur insuffisante ou mal épissés.
- Ne pas enrouler les câbles autour du corps.
- Si la pièce soudée doit être mise à la terre, le faire directement avec un câble distinct.
- Ne pas toucher l'électrode quand on est en contact avec la pièce, la terre ou une électrode provenant d'une autre machine.
- Ne pas toucher des porte électrodes connectés à deux machines en même temps à cause de la présence d'une tension à vide doublée.
- N'utiliser qu'un matériel en bon état. Réparer ou remplacer sur-le-champ les pièces endommagées. Entretenir l'appareil conformément à ce manuel.
- Porter un harnais de sécurité si l'on doit travailler au-dessus du sol.
- S'assurer que tous les panneaux et couvercles sont correctement en place.
- Fixer le câble de retour de façon à obtenir un bon contact métal-métal avec la pièce à souder ou la table de travail, le plus près possible de la soudure.
- Isoler la pince de masse quand pas mis à la pièce pour éviter le contact avec tout objet métallique.
- Ne pas raccorder plus d'une électrode ou plus d'un câble de masse à une même borne de sortie de soudage. Débrancher le câble pour le procédé non utilisé.

Il reste une TENSION DC NON NÉGLIGEABLE dans les sources de soudage onduleur UNE FOIS l'alimentation coupée.

- Arrêter les convertisseurs, débrancher le courant électrique et décharger les condensateurs d'alimentation selon les instructions indiquées dans la partie Entretien avant de toucher les pièces.

LES PIÈCES CHAUDES peuvent provoquer des brûlures.

- Ne pas toucher à mains nues les parties chaudes.
- Prévoir une période de refroidissement avant de travailler à l'équipement.
- Ne pas toucher aux pièces chaudes, utiliser les outils recommandés et porter des gants de soudage et des vêtements épais pour éviter les brûlures.

LES FUMÉES ET LES GAZ peuvent être dangereux.

Le soudage génère des fumées et des gaz. Leur inhalation peut être dangereux pour votre santé.

- Eloigner votre tête des fumées. Ne pas respirer les fumées.
- À l'intérieur, ventiler la zone et/ou utiliser une ventilation forcée au niveau de l'arc pour l'évacuation des fumées et des gaz de soudage.
- Si la ventilation est médiocre, porter un respirateur anti-vapeurs approuvé.
- Lire et comprendre les spécifications de sécurité des matériaux (MSDS) et les instructions du fabricant concernant les métaux, les consommables, les revêtements, les nettoyants et les dégraisseurs.
- Travailler dans un espace fermé seulement s'il est bien ventilé ou en portant un respirateur à alimentation d'air. Demander toujours à un surveillant dûment formé de se tenir à proximité. Des fumées et des gaz de soudage peuvent déplacer l'air et abaisser le niveau d'oxygène provoquant des blessures ou des accidents mortels. S'assurer que l'air de respiration ne présente aucun danger.
- Ne pas souder dans des endroits situés à proximité d'opérations de dégraissage, de nettoyage ou de pulvérisation. La chaleur et les rayons de l'arc peuvent réagir en présence de vapeurs et former des gaz hautement toxiques et irritants.
- Ne pas souder des métaux munis d'un revêtement, tels que l'acier galvanisé, plaqué en plomb ou au cadmium à moins que le revêtement n'ait été enlevé dans la zone de soudure, que l'endroit soit bien ventilé, et en portant un respirateur à alimentation d'air. Les revêtements et tous les métaux renfermant ces éléments peuvent dégager des fumées toxiques en cas de soudage.

LES RAYONS DE L'ARC peuvent provoquer des brûlures dans les yeux et sur la peau.

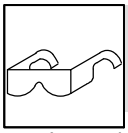
Le rayonnement de l'arc du procédé de soudag génère des rayons visibles et invisibles intense (ultraviolets et infrarouges) susceptibles de provoquer des brûlure dans les yeux et sur la peau. Des étincelles sont projetées pendant l soudage.

- Porter un casque de soudage approuvé muni de verres filtrants approprié pour protéger visage et yeux pour protéger votre visage et vos yeux pendant le soudage ou pour regarder (voir ANSI Z49.1 et Z87.1 énuméré dans les normes de sécurité).
- Porter des lunettes de sécurité avec écrans latéraux même sous votre casque.
- Avoir recours à des écrans protecteurs ou à des rideaux pour protéger les autres contre les rayonnements les éblouissements et les étincelles ; prévenir toute personne sur les lieux de ne pas regarder l'arc.
- Porter des vêtements confectionnés avec des matières résistantes et ignifuges (cuir, coton lourd ou laine) et des bottes de protection.

LE SOUDAGE peut provoquer un incendie ou une explosion.

Le soudage effectué sur des conteneurs fermés tels que des réservoirs, tambours ou des conduites peut provoquer leur éclatement. Des étincelles peuvent être projetées de l'arc de soudure. La projection d'étincelles, des pièces chaudes et des équipements chauds peut provoquer des incendies et des brûlures. Le contact accidentel de l'électrode avec des objets métalliques peut provoquer des étincelles, une explosion, un surchauffement ou un incendie. Avant de commencer le soudage, vérifier et s'assurer que l'endroit ne présente pas de danger.

- Déplacer toutes les substances inflammables à une distance de 10,7 m de l'arc de soudage. En cas d'impossibilité les recouvrir soigneusement avec des protections homologués.
- Ne pas souder dans un endroit là où des étincelles peuvent tomber sur des substances inflammables.
- Se protéger et d'autres personnes de la projection d'étincelles et de métal chaud.
- Des étincelles et des matériaux chauds du soudage peuvent facilement passer dans d'autres zones en traversant de petites fissures et des ouvertures.
- Surveiller tout déclenchement d'incendie et tenir un extincteur à proximité.
- Le soudage effectué sur un plafond, plancher, paroi ou séparation peut déclencher un incendie de l'autre côté.
- Ne pas effectuer le soudage sur des conteneurs fermés tels que des réservoirs, tambours, ou conduites, à moins qu'ils n'aient été préparés correctement conformément à AWS F4.1 et AWS A6.0 (voir les Normes de Sécurité).
- Ne soudez pas si l'air ambiant est chargé de particules, gaz, ou vapeurs inflammables (vapeur d'essence, par exemple).
- Brancher le câble de masse sur la pièce le plus près possible de la zone de soudage pour éviter le transport du courant sur une longue distance par des chemins inconnus éventuels en provoquant des risques d'électrocution, d'étincelles et d'incendie.
- Ne pas utiliser le poste de soudage pour dégeler des conduites gelées.
- En cas de non utilisation, enlever la baguette d'électrode du porte-électrode ou couper le fil à la pointe de contact.
- Porter des vêtements de protection dépourvus d'huile tels que des gants en cuir, une chemise en matériau lourd, des pantalons sans revers, des chaussures hautes et un couvre chef.
- Avant de souder, retirer toute substance combustible de vos poches telles qu'un allumeur au butane ou des allumettes.
- Une fois le travail achevé, assurez–vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe–circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Une fois le travail achevé, assurez–vous qu'il ne reste aucune trace d'étincelles incandescentes ni de flammes.
- Utiliser exclusivement des fusibles ou coupe–circuits appropriés. Ne pas augmenter leur puissance; ne pas les ponter.
- Suivre les recommandations dans OSHA 1910.252(a)(2)(iv) et NFPA 51B pour les travaux à chaud et avoir de la surveillance et un extincteur à proximité.



DES PIECES DE METAL ou DES SALETES peuvent provoquer des blessures dans les yeux.

- Le soudage, l'écaillement, le passage de la pièce à la brosse en fil de fer, et le meulage génèrent des étincelles et des particules métalliques volantes. Pendant la période de refroidissement des soudures, elles risquent de projeter du laitier.
- Porter des lunettes de sécurité avec écrans latéraux ou un écran facial.

LES ACCUMULATIONS DE GAZ risquent de provoquer des blessures ou même la mort.

- Fermer l'alimentation du gaz comprimé en cas de non utilisation.
- Veiller toujours à bien aérer les espaces confinés ou se servir d'un respirateur d'adduction d'air homologué.

Les CHAMPS ÉLECTROMAGNÉTIQUES (CEM) peuvent affecter les implants médicaux.

- Les porteurs de stimulateurs cardiaques et autres implants médicaux doivent rester à distance.
- Les porteurs d'implants médicaux doivent consulter leur médecin et le fabricant du dispositif avant de s'approcher de la zone où se déroule du soudage à l'arc, du soudage par points, du gougeage, de la découpe plasma ou une opération de chauffage par induction.

LE BRUIT peut endommager l'ouïe.

Le bruit des processus et des équipements peut affecter l'ouïe.

- Porter des protections approuvées pour les oreilles si le niveau sonore est trop élevé.

LES BOUTEILLES peuvent exploser si elles sont endommagées.

Les bouteilles de gaz comprimé contiennent du gaz sous haute pression. Si une bouteille est endommagée, elle peut exploser. Du fait que les bouteilles de gaz font normalement partie du procédé de soudage, les manipuler avec précaution.

- Protéger les bouteilles de gaz comprimé d'une chaleur excessive, des chocs mécaniques, des dommages physiques, du laitier, des flammes ouvertes, des étincelles et des arcs.
- Placer les bouteilles debout en les fixant dans un support stationnaire ou dans un porte-bouteilles pour les empêcher de tomber ou de se renverser.
- Tenir les bouteilles éloignées des circuits de soudage ou autres circuits électriques.
- Ne jamais placer une torche de soudage sur une bouteille à gaz.
- Une électrode de soudage ne doit jamais entrer en contact avec une bouteille.
- Ne jamais souder une bouteille pressurisée – risque d'explosion.
- Utiliser seulement des bouteilles de gaz comprimé, régulateurs, tuyaux et raccords convenables pour cette application spécifique; les maintenir ainsi que les éléments associés en bon état.
- Détourner votre visage du détendeur-régulateur lorsque vous ouvrez la soupape de la bouteille.
- Le couvercle du détendeur doit toujours être en place, sauf lorsque la bouteille est utilisée ou qu'elle est reliée pour usage ultérieur.
- Utiliser les équipements corrects, les bonnes procédures et suffisamment de personnes pour soulever et déplacer les bouteilles.
- Lire et suivre les instructions sur les bouteilles de gaz comprimé, l'équipement connexe et le dépliant P-1 de la CGA (Compressed Gas Association) mentionné dans les principales normes de sécurité.

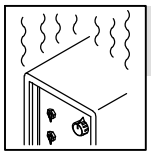
2-3. Dangers supplémentaires en relation avec l'installation, le fonctionnement et la maintenance

Risque D'INCENDIE OU D'EXPLOSION.

- Ne pas placer l'appareil sur, au-dessus ou à proximité de surfaces inflammables.
- Ne pas installer l'appareil à proximité de produits inflammables.
- Ne pas surcharger l'installation électrique – s'assurer que l'alimentation est correctement dimensionnée et protégée avant de mettre l'appareil en service.

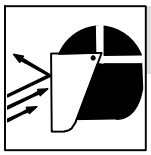
LA CHUTE DE L'ÉQUIPEMENT peut provoquer des blessures.

- Utiliser l'anneau de levage uniquement pour soulever l'appareil, NON PAS les chariots, les bouteilles de gaz ou tout autre accessoire.
- Utiliser un équipement de levage de capacité suffisante pour lever l'appareil.
- En utilisant des fourches de levage pour déplacer l'unité, s'assurer que les fourches sont suffisamment longues pour dépasser du côté opposé de l'appareil.
- Tenir l'équipement (câbles et cordons) à distance des véhicules mobiles lors de toute opération en hauteur.
- Suivre les consignes du Manuel des applications pour l'équation de levage NIOSH révisée (Publication Nº94–110) lors du levage manuelle de pièces ou équipements lourds.



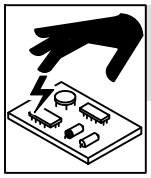
L'EMPLOI EXCESSIF peut SURCHAUFFER L'ÉQUIPEMENT.

- Prévoir une période de refroidissement ; respecter le cycle opératoire nominal.
- Réduire le courant ou le facteur de marche avant de poursuivre le soudage.
- Ne pas obstruer les passages d'air du poste.



LES ÉTINCELLES PROJETÉES peuvent provoquer des blessures.

- Porter un écran facial pour protéger le visage et les yeux.
- Affûter l'électrode au tungstène uniquement à la meuleuse dotée de protecteurs. Cette manœuvre est à exécuter dans un endroit sûr lorsque l'on porte l'équipement homologué de protection du visage, des mains et du corps.
- Les étincelles risquent de causer un incendie – éloigner toute substance inflammable.



LES CHARGES ÉLECTROSTATIQUES peuvent endommager les circuits imprimés.

- Établir la connexion avec la barrette de terre avant de manipuler des cartes ou des pièces.
- Utiliser des pochettes et des boîtes antistatiques pour stocker, déplacer ou expédier des cartes de circuits imprimes.

Les PIÈCES MOBILES peuvent causer des blessures.

- Ne pas s'approcher des organes mobiles.
- Ne pas s'approcher des points de coincement tels que des rouleaux de commande.

LES FILS DE SOUDAGE peuvent provoquer des blessures.

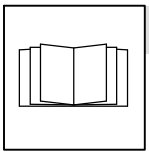
- Ne pas appuyer sur la gâchette avant d'en avoir reçu l'instruction.
- Ne pas diriger le pistolet vers soi, d'autres personnes ou toute pièce mécanique en engageant le fil de soudage.

L'EXPLOSION DE LA BATTERIE peut provoquer des blessures.

- Ne pas utiliser l'appareil de soudage pour charger des batteries ou faire démarrer des véhicules à l'aide de câbles de démarrage, sauf si l'appareil dispose d'une fonctionnalité de charge de batterie destinée à cet usage.

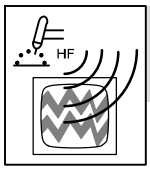
Les PIÈCES MOBILES peuvent causer des blessures.

- S'abstenir de toucher des organes mobiles tels que des ventilateurs.
- Maintenir fermés et verrouillés les portes, panneaux, recouvrements et dispositifs de protection.
- Lorsque cela est nécessaire pour des travaux d'entretien et de dépannage, faire retirer les portes, panneaux, recouvrements ou dispositifs de protection uniquement par du personnel qualifié.
- Remettre les portes, panneaux, recouvrements ou dispositifs de protection quand l'entretien est terminé et avant de rebrancher l'alimentation électrique.



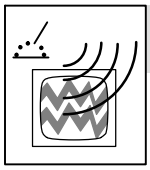
LIRE LES INSTRUCTIONS.

- Lire et appliquer les instructions sur les étiquettes et le Mode d'emploi avant l'installation, l'utilisation ou l'entretien de l'appareil. Lire les informations de sécurité au début du manuel et dans chaque section.
- N'utiliser que les pièces de rechange recommandées par le constructeur.
- Effectuer l'entretien en respectant les manuels d'utilisation, les normes industrielles et les codes nationaux, d'état et locaux.



LE RAYONNEMENT HAUTE FRÉQUENCE (H.F.) risque de provoquer des interférences.

- Le rayonnement haute fréquence (H.F.) peut provoquer des interférences avec les équipements de radio–navigation et de communication, les services de sécurité et les ordinateurs.
- Demander seulement à des personnes qualifiées familiarisées avec des équipements électroniques de faire fonctionner l'installation.
- L'utilisateur est tenu de faire corriger rapidement par un électricien qualifié les interférences résultant de l'installation.
- Si le FCC signale des interférences, arrêter immédiatement l'appareil.
- Effectuer régulièrement le contrôle et l'entretien de l'installation.
- Maintenir soigneusement fermés les portes et les panneaux des sources de haute fréquence, maintenir les éclateurs à une distance correcte et utiliser une terre et un blindage pour réduire les interférences éventuelles.



LE SOUDAGE À L'ARC risque de provoquer des interférences.

- L'énergie électromagnétique risque de provoquer des interférences pour l'équipement électronique sensible tel que les ordinateurs et l'équipement commandé par ordinateur tel que les robots.
- Veiller à ce que tout l'équipement de la zone de soudage soit compatible électromagnétiquement.
- Pour réduire la possibilité d'interférence, maintenir les câbles de soudage aussi courts que possible, les grouper, et les poser aussi bas que possible (ex. par terre).
- Veiller à souder à une distance de 100 mètres de tout équipement électronique sensible.
- Veiller à ce que ce poste de soudage soit posé et mis à la terre conformément à ce mode d'emploi.
- En cas d'interférences après avoir pris les mesures précédentes, il incombe à l'utilisateur de prendre des mesures supplémentaires telles que le déplacement du poste, l'utilisation de câbles blindés, l'utilisation de filtres de ligne ou la pose de protecteurs dans la zone de travail.

2-4. Proposition californienne 65 Avertissements

⚠ **Les équipements de soudage et de coupage produisent des fumées et des gaz qui contiennent des produits chimiques dont l'État de Californie reconnaît qu'ils provoquent des malformations congénitales et, dans certains cas, des cancers. (Code de santé et de sécurité de Californie, chapitre 25249.5 et suivants)**

⚠ **Ce produit contient des produits chimiques, notamment du plomb, dont l'État de Californie reconnaît qu'ils provoquent des cancers, des malformations congénitales ou d'autres problèmes de procréation. *Se laver les mains après utilisation.***

2-5. Principales normes de sécurité

Safety in Welding, Cutting, and Allied Processes, ANSI Standard Z49.1, is available as a free download from the American Welding Society at http://www.aws.org or purchased from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for the Preparation of Containers and Piping for Welding and Cutting, American Welding Society Standard AWS F4.1, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

Safe Practices for Welding and Cutting Containers that have Held Combustibles, American Welding Society Standard AWS A6.0, from Global Engineering Documents (phone: 1-877-413-5184, website: www.global.ihs.com).

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org and www. sparky.org).

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 14501 George Carter Way, Suite 103, Chantilly, VA 20151 (phone: 703-788-2700, website:www.cganet.com).

Safety in Welding, Cutting, and Allied Processes, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 5060 Spectrum Way, Suite 100, Ontario, Canada L4W 5NS (phone: 800-463-6727, website: www.csa-international.org).

Safe Practice For Occupational And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 25 West 43rd Street, New York, NY 10036 (phone: 212-642-4900, website: www.ansi.org).

Standard for Fire Prevention During Welding, Cutting, and Other Hot Work, NFPA Standard 51B, from National Fire Protection Association, Quincy, MA 02269 (phone: 1-800-344-3555, website: www.nfpa.org.

OSHA, Occupational Safety and Health Standards for General Industry, Title 29, Code of Federal Regulations (CFR), Part 1910, Subpart Q, and Part 1926, Subpart J, from U.S. Government Printing Office, Superintendent of Documents, P.O. Box 371954, Pittsburgh, PA 15250-7954 (phone: 1-866-512-1800) (there are 10 OSHA Regional Offices—phone for Region 5, Chicago, is 312-353-2220, website: www.osha.gov).

Applications Manual for the Revised NIOSH Lifting Equation, The National Institute for Occupational Safety and Health (NIOSH), 1600 Clifton Rd, Atlanta, GA 30333 (phone: 1-800-232-4636, website: www.cdc.gov/NIOSH).

2-6. Informations relatives aux CEM

Le courant électrique qui traverse tout conducteur génère des champs électromagnétiques (CEM) à certains endroits. Le courant de soudage crée un CEM autour du circuit et du matériel de soudage. Les CEM peuvent créer des interférences avec certains implants médicaux comme des stimulateurs cardiaques. Des mesures de protection pour les porteurs d'implants médicaux doivent être prises: Limiter par exemple tout accès aux passants ou procéder à une évaluation des risques individuels pour les soudeurs. Tous les soudeurs doivent appliquer les procédures suivantes pour minimiser l'exposition aux CEM provenant du circuit de soudage:

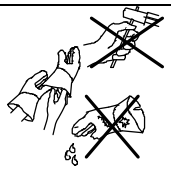
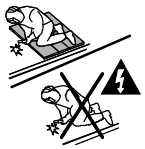
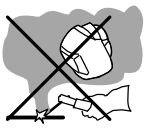
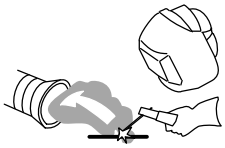
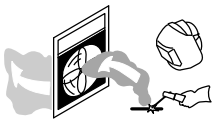
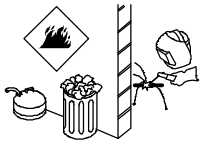
1. Rassembler les câbles en les torsadant ou en les attachant avec du ruban adhésif ou avec une housse.
2. Ne pas se tenir au milieu des câbles de soudage. Disposer les câbles d'un côté et à distance de l'opérateur.
3. Ne pas courber et ne pas entourer les câbles autour de votre corps.
4. Maintenir la tête et le torse aussi loin que possible du matériel du circuit de soudage.
5. Connecter la pince sur la pièce aussi près que possible de la soudure.
6. Ne pas travailler à proximité d'une source de soudage, ni s'asseoir ou se pencher dessus.
7. Ne pas souder tout en portant la source de soudage ou le dévidoir.

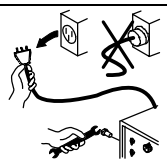
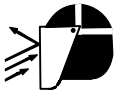
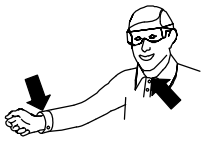
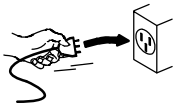
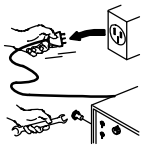
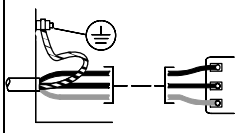
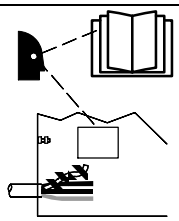
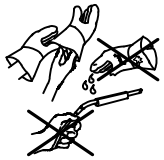
En ce qui concerne les implants médicaux :

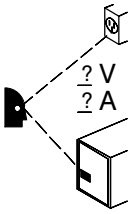
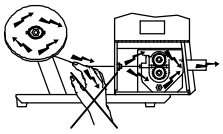
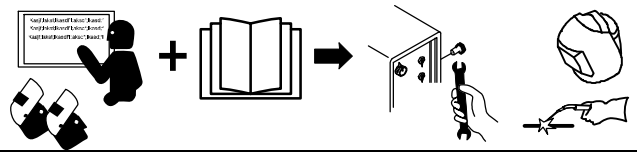
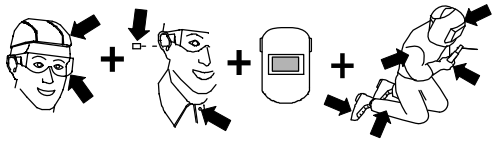
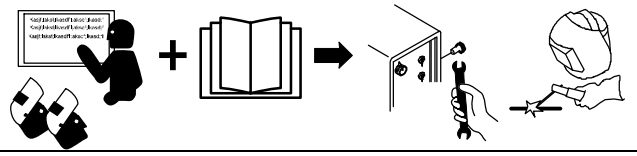
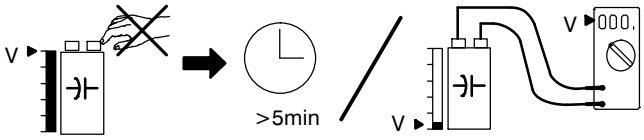
Les porteurs d'implants doivent d'abord consulter leur médecin avant de s'approcher des opérations de soudage à l'arc, de soudage par points, de gougeage, du coupage plasma ou de chauffage par induction. Si le médecin approuve, il est recommandé de suivre les procédures précédentes.

SECTION 3 – DEFINITIONS

3-1. Manufacturer's Warning Label Definitions

	Warning! Watch Out! There are possible hazards as shown by the symbols. Safe1 2012-05
	Wear dry insulating gloves. Do not touch electrode with bare hand. Do not wear wet or damaged gloves. Safe2 2012-05
	Protect yourself from electric shock by insulating yourself from work and ground. Safe3 2012-05
	Keep your head out of the fumes. Safe6 2012-05
	Use forced ventilation or local exhaust to remove the fumes. Safe8 2012-05
	Use ventilating fan to remove fumes. Safe10 2012-05
	Keep flammables away from welding. Do not weld near flammables. Safe12 2012-05
	Welding sparks can cause fires. Have a fire extinguisher nearby, and have a watchperson ready to use it. Safe14 2012-05
	Do not weld on drums or any closed containers. Safe16 2012-05
	Do not remove or paint over (cover) the label. Safe20 2012-05

	Disconnect input plug or power before working on machine. Safe5 2012-05
	When power is applied failed parts can explode or cause other parts to explode. Safe26 2012-05
	Flying pieces of parts can cause injury. Always wear a face shield when servicing unit. Safe27 2012-05
	Always wear long sleeves and button your collar when servicing unit. Safe28 2012-05
	After taking proper precautions as shown, connect power to unit. Safe29 2012-05
	Do not discard product with general waste. Reuse or recycle Waste Electrical and Electronic Equipment (WEEE) by disposing at a designated collection facility. Contact your local recycling office or your local distributor for further information. Safe37 2012-05
	Beware of electric shock from wiring. Safe94 2012-08
	Disconnect input plug or power before working on machine. Safe30 2012-05
	Connect Green Or Green/Yellow grounding conductor to ground terminal first. Connect input conductors (L1, L2, L3) to line terminals. Safe36 2012-05
	Become trained and read the instructions and labels before working on machine. Safe35 2012-05
	Wear dry insulating gloves. Do not touch electrode (wire) with bare hand. Do not wear wet or damaged gloves. Safe57 2012-05

	Consult rating label for input power requirements. Safe34 2012-05
	Drive rolls can injure fingers. Safe32 2012-05
	Welding wire and drive parts are at welding voltage during operation – keep hands and metal objects away. Safe33 2012-05
	Become trained and read the instructions before working on the machine or welding. Safe65 2012-06
	Wear hat and safety glasses. Use ear protection and button shirt collar. Use welding helmet with correct shade of filter. Wear complete body protection. Safe38 2012-05
	Become trained and read the instructions before working on the machine or welding. Safe40 2012-05
	Hazardous voltage remains on input capacitors after power is turned off. Do not touch fully charged capacitors. Always wait 5 minutes after power is turned off before working on unit, OR check input capacitor voltage, and be sure it is near 0 before touching any parts. Safe43 2012-05

Notes

3-2. Miscellaneous Symbols And Definitions

A	Amperage		Direct Current (DC)		Alternating Current (AC)	V	Voltage
	Gas Input		Circuit Breaker		To Power Source	I	On
	Off		Positive		Gas Output		Shielded Metal Arc Welding (SMAW)
	Gas Tungsten Arc Welding (GTAW) / Tungsten Inert Gas (TIG) Welding		Work Connection		Wire Feed		Protective Earth (Ground)
	Increase		Line Connection		Gas Metal Arc Welding (GMAW)		Three Phase Static Frequency Converter-Transformer-Rectifier
U_0	Rated No Load Voltage (Average)	U_1	Primary Voltage	U_2	Conventional Load Voltage	X	Duty Cycle
Hz	Hertz	S	Suitable for Some Hazardous Locations	I_2	Rated Welding Current	%	Percent
	Pulsed	3	Three Phase	1	Single Phase		Gas Type
	Trigger Select	M	Save To Memory	M	Recall From Memory		Busy
SD	SD Logo Is A Trademark Of The SD–3C, LLC		Electrode Type		Flux Cored Arc Welding (FCAW)		Pulse Transfer
	Wire Type	∅ MM / IN	Wire Diameter		Two-Step Trigger Operation (GTAW)		Four-Step Trigger Operation (GTAW)
t_1	Gas Preflow		Impulse Start (GTAW)		Touch Start (GTAW)		Program
t_2	Gas Postflow		Process Cycle		Welding (General)	S	Seconds
tA	Initial Sequence	t	Initial Slope	t	Final Slope	At	Final Sequence
	Press		Side Select	I_1	Rated Supply Current	IP	Internal Protection Rating
VS	Volt Sense Input	14	Remote 14		Trigger Hold Off		Trigger Hold On
	Purge By Gas		Left Side Select		Right Side Select		RMD Process
	Arc Control						

SECTION 4 – SPECIFICATIONS

4-1. Important Information Regarding CE Products (Sold Within The EU)

A. Information On Electromagnetic Fields (EMF)

This equipment shall not be used by the general public as the EMF limits for the general public might be exceeded during welding.

This equipment is built in accordance with EN 60974–1 and is intended to be used only in an occupational environment (where the general public access is prohibited or regulated in such a way as to be similar to occupational use) by an expert or an instructed person.

Wire feeders and ancillary equipment (such as torches, liquid cooling systems and arc striking and stabilizing devices) as part of the welding circuit may not be a major contributor to the EMF. See the Owner's Manuals for all components of the welding circuit for additional EMF exposure information.

- The EMF assessment on this equipment was conducted at 0.5 meter.
- At a distance of 1 meter the EMF exposure values were less than 20% of the permissible values.

ce-emf 1 2010-10

B. Information On Electromagnetic Compatibility (EMC)

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low–voltage supply system. There can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radiated disturbances.

This equipment complies with IEC 61000–3–12 provided that the short–circuit power Ssc is greater than or equal to 9,138,888 at the interface point between the user's supply and the public system. It is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator if necessary, that the equipment is connected only to a supply with a short–circuit power Ssc greater than or equal to 9,138,888.

ce-emc 1 2011-09

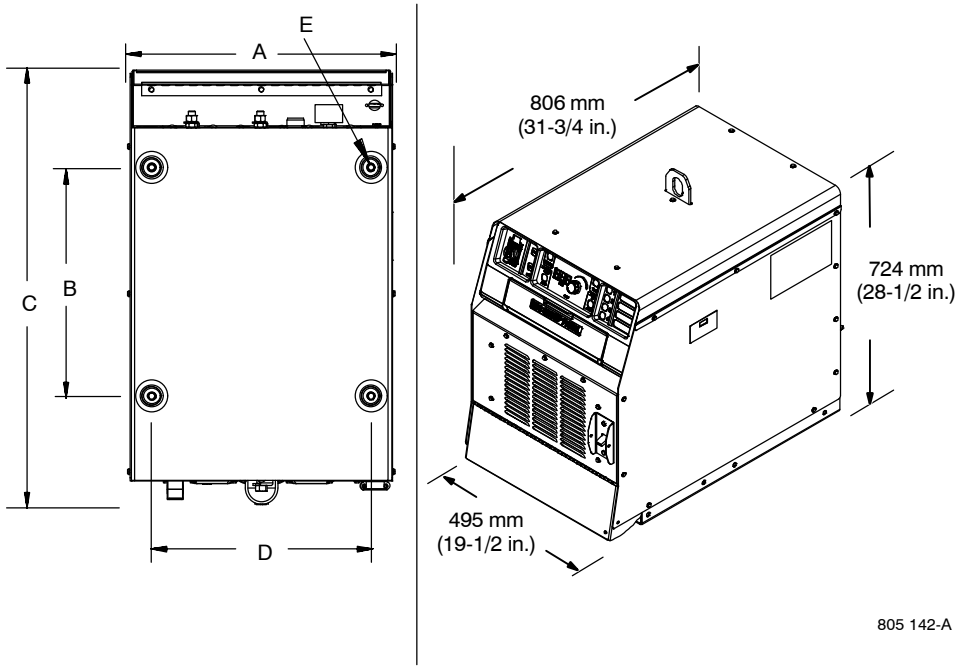
4-2. General Specifications

A. Welding Power Source Specifications

Input Power	Welding Process	Rated Welding Output	Amperage Range Setting (CC Process)	Voltage Range Setting (CV Process)	Maximum Open-Circuit Voltage DC	Amperes Input At Rated Load Output 50/60 Hz, Three-Phase		KVA		KW	
						380 V	400 V	380	400	380	400
Three Phase	Stick	400 A @ 36 Volts DC, 100% Duty Cycle	40 – 400	— —	90	26.3	25.5	17.6	17.8	16.5	16.5
	TIG	350 A @ 24 Volts DC, 100% Duty Cycle	10-350	— —		19.0	18.1	12.4	12.5	9.7	9.8
	MIG	400 A @ 34 Volts DC, 100% Duty Cycle	— —	10-44		27.1	25.7	18	18	15.5	15.6
	Flux Cored	400 A @ 34 Volts DC, 100% Duty Cycle	— —	10-44		27.1	25.7	18	18	15.5	15.6
To appropriately size circuit protection see Section 5-10.											

B. Dimensions And Weight

Hole Layout Dimensions	
A	495 mm (19-1/2 in.)
B	424 mm (16-7/8 in.)
C	806 mm (31-3/4 in.)
D	406.4 mm (16 in.)
E	5/16-18 in. UNC thread
Weight	
102 kg (225 lb)	

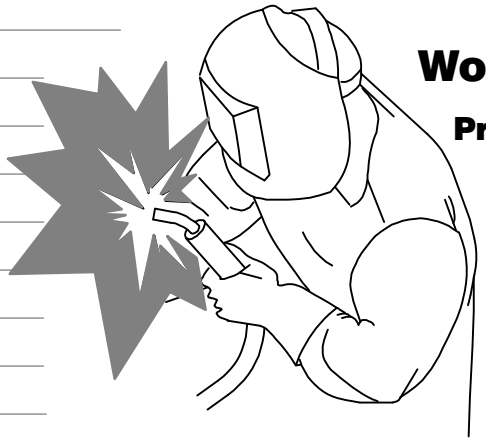


C. Wire Feeder Specifications

Input Power	Welding Power Source Type	Wire Feed Speed Range	Wire Diameter Range	Welding Circuit Rating	IP Rating*	Overall Dimensions	Weight	
							Single	Dual
24 Volts AC 11 Amperes	PipeWorx 400	1.3 To 19.8 mpm (50 To 780 ipm)	0.9 To 1.6 mm (.035 To .062 in.) Max Spool Weight: 27 kg (60 lb)	100 Volts, 750 Amperes, 100% Duty Cycle	IP 21	Length: 737 mm (29 in.) Width: 483 mm (19 in.) Height: 356 mm (14 in.)	30 kg (65 lb)	41 kg (90 lb)

*This equipment is designed for indoor use and is not intended to be used or stored outside.

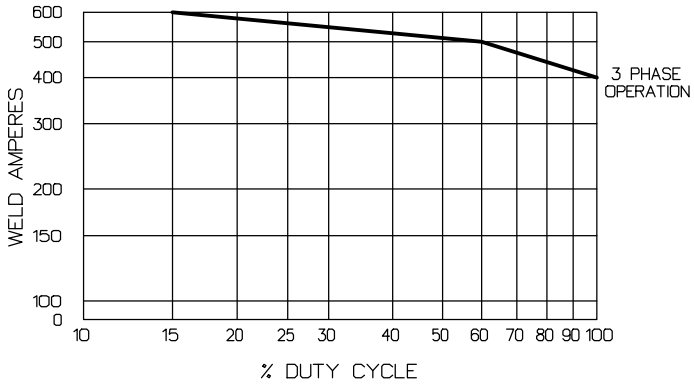
Notes



Work like a Pro!

Pros weld and cut safely. Read the safety rules at the beginning of this manual.

4-3. MIG Duty Cycle and Overheating

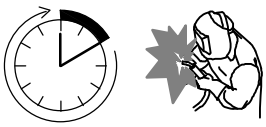


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage or duty cycle before welding.

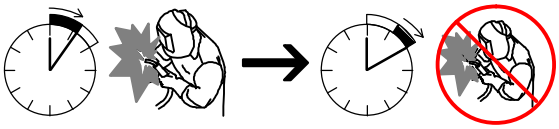
NOTICE – *Exceeding duty cycle can damage unit and void warranty.*

100% Duty Cycle At 400 Amperes



Continuous Welding

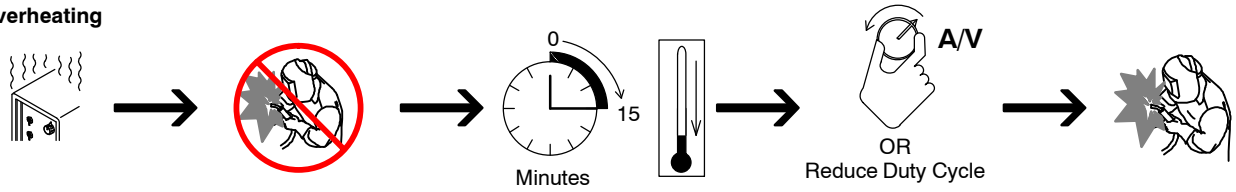
60% Duty Cycle At 500 Amperes



6 Minutes Welding

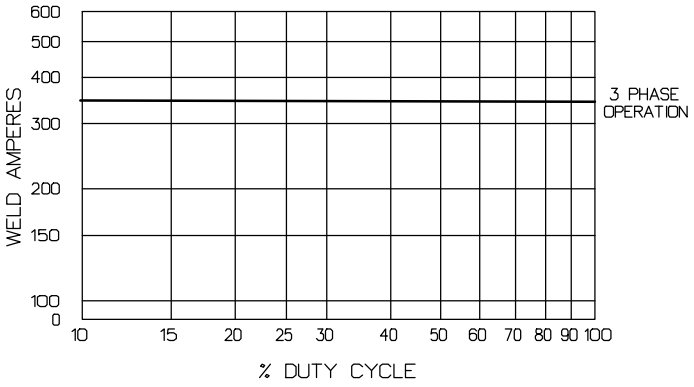
4 Minutes Resting

Overheating



duty1 4/95 – 240 110-A

4-4. Stick And TIG Duty Cycle and Overheating

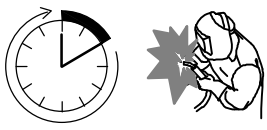


Duty Cycle is percentage of 10 minutes that unit can weld at rated load without overheating.

If unit overheats, thermostat(s) opens, output stops, and cooling fan runs. Wait fifteen minutes for unit to cool. Reduce amperage, voltage, wire feed speed, or duty cycle before welding.

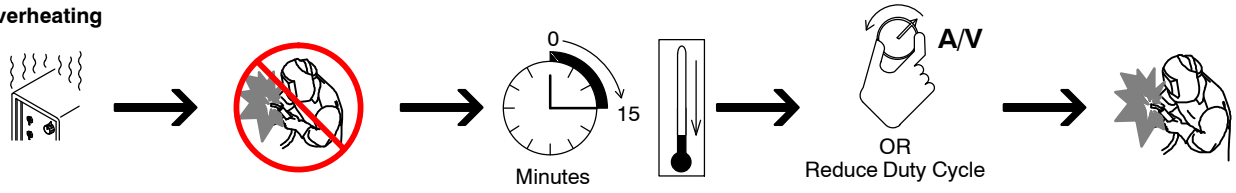
NOTICE – *Exceeding duty cycle can damage unit and void warranty.*

100% Duty Cycle At 400 Amperes



Continuous Welding

Overheating



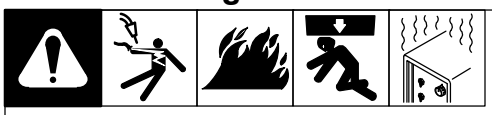
duty1 4/95 – 240 110-A

SECTION 5 – INSTALLATION

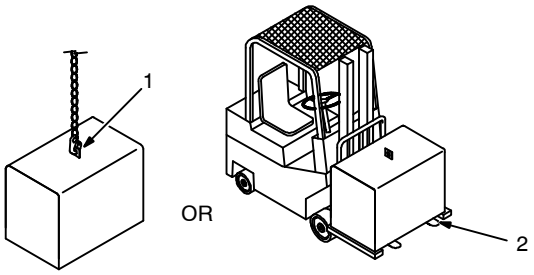
5-1. Serial Number And Rating Label Location

The serial number and rating information for this product is located on the front. Use rating label to determine input power requirements and/or rated output. For future reference, write serial number in space provided on back cover of this manual.

5-2. Selecting a Location



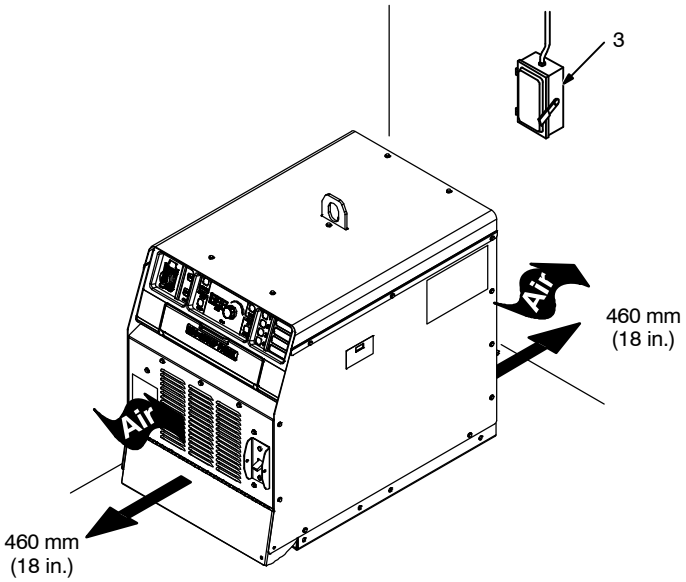
Movement



Tipping

Do not move or operate unit where it could tip.

Location



1 Lifting Eye

2 Lifting Forks

Use lifting eye or lifting forks to move unit.

If using lifting forks, extend forks beyond opposite side of unit.

3 Line Disconnect Device

Locate unit near correct input power supply.

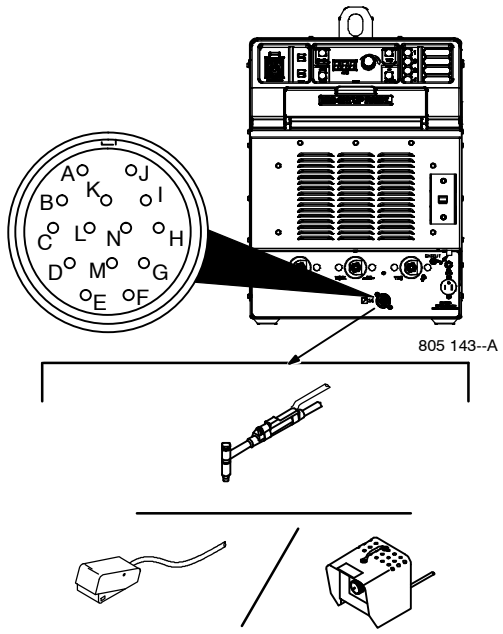
Special installation may be required where gasoline or volatile liquids are present – see NEC Article 511 or CEC Section 20.

loc_2 3/96 – Ref. 805 142-A

5-3. Remote 14 Accessory Receptacle Information

If a remote control is connected to the Remote 14 receptacle, the unit will automatically adjust output control to a primary/secondary configuration. In this configuration, the Amperage Adjust knob on the unit becomes the primary and sets the maximum amperage output of the unit. The remote control becomes the secondary and provides an amperage range of 0 to 100% based on the Amperage Adjust knob setting.

☞ *The Remote 14 receptacle is factory set to be active in TIG mode only. As an option, this receptacle may also be enabled in Stick mode (see Section 5-4).*

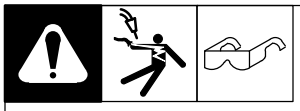


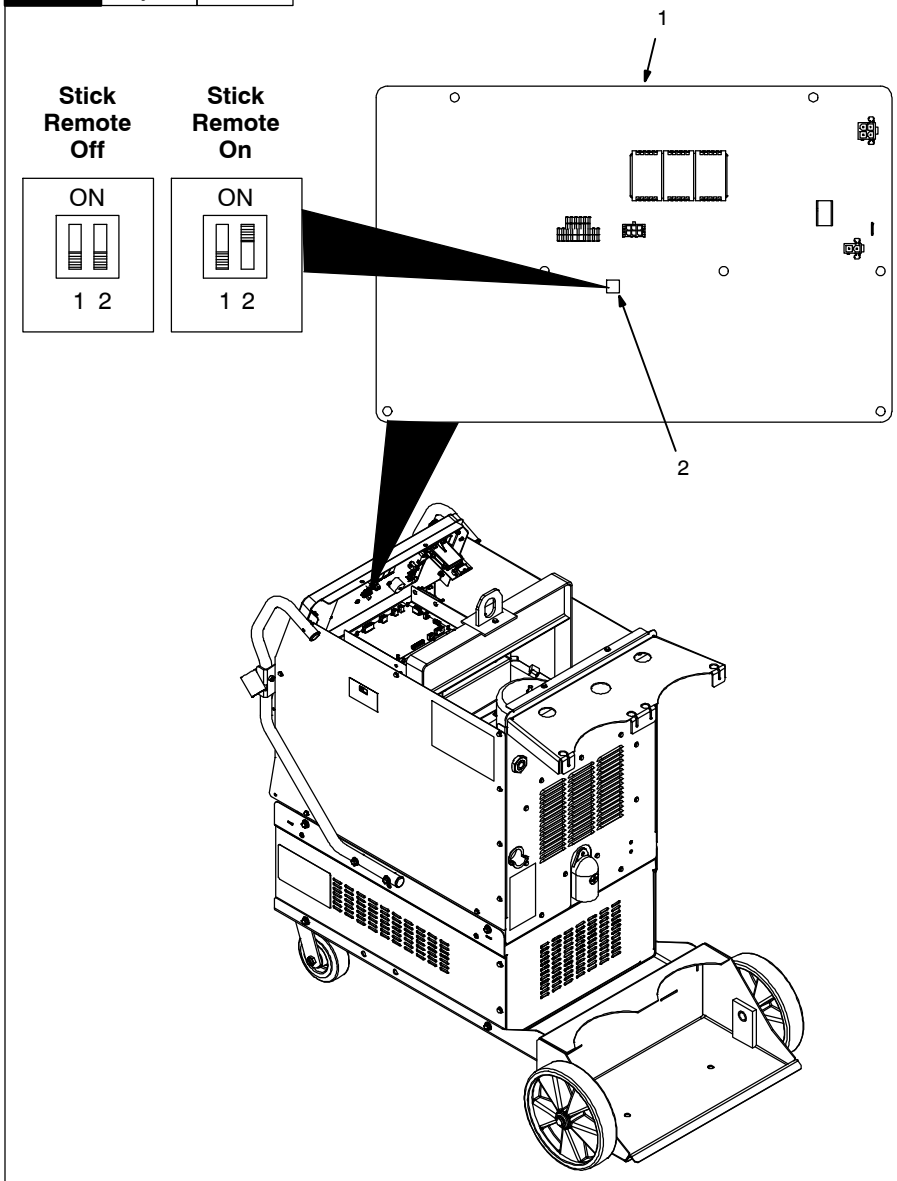
REMOTE 14	Socket*	Socket Information
15 VOLTS DC OUTPUT (CONTACTOR)	A	15 volts DC.
	B	Contact closure to A completes 15 volts DC contactor control circuit.
REMOTE CONTROL	C	Output to remote control; +10 volts DC.
	D	Remote control circuit common.
	E	0 to +10 volts DC input command signal from remote control.
GND	K	Chassis common.

*The remaining sockets are not used.

Notes

5-4. Turning On Remote 14 Receptacle Control For Stick





Turn Off welding power source, disconnect input power, and check voltage on input capacitors according to Section 7-6 before proceeding.

When this control is active and a current/contactor control is connected to the Remote 14 receptacle on the power source front panel, the contactor and primary/secondary amperage control will function in both TIG and Stick modes.

1 User Interface Board

2 Dip Switch

Remove feeder and side mount cable hangers from top of unit, if applicable.

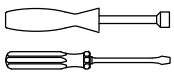
Remove top cover from power source.

Move number 2 switch to the up position (on stick side). Use a small screwdriver to move switch, if necessary.

Reinstall cover.

Replace side mount cable hangers and feeder to top of unit, if applicable.

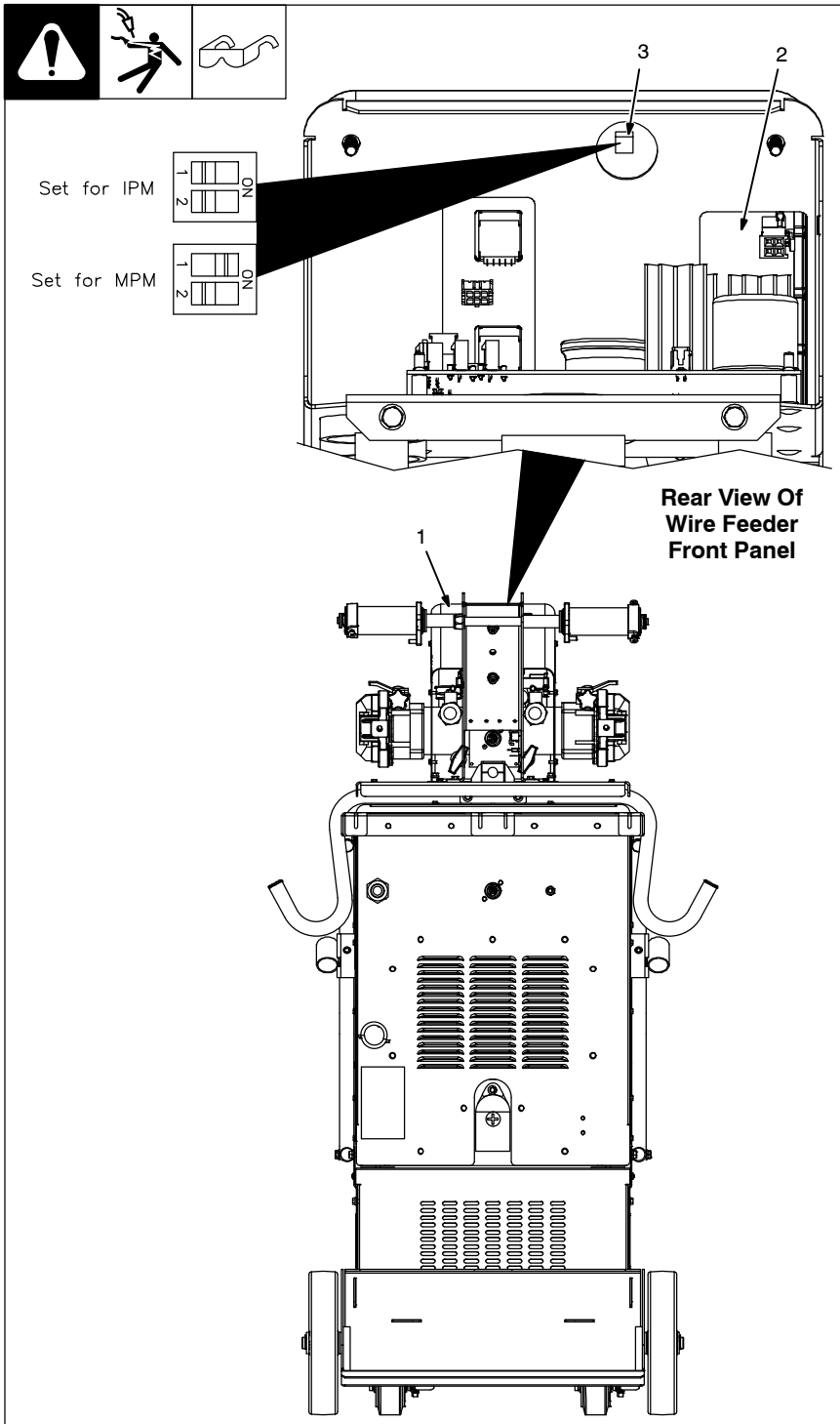
Tools Needed:



5/16 in.

805 288-A

5-5. Changing Wire Feed Speed From Inches Per Minute (IPM) To Meters Per Minute (MPM)



Turn Off welding power source, disconnect input power, and check voltage on input capacitors according to Section 7-6 before proceeding.

1 PipeWorx Feeder

2 Operator Interface Board

3 Dip Switch

Remove feeder wrapper.

Move number 1 switch (top switch) to the ON position. Use a small screwdriver to move switch, if necessary.

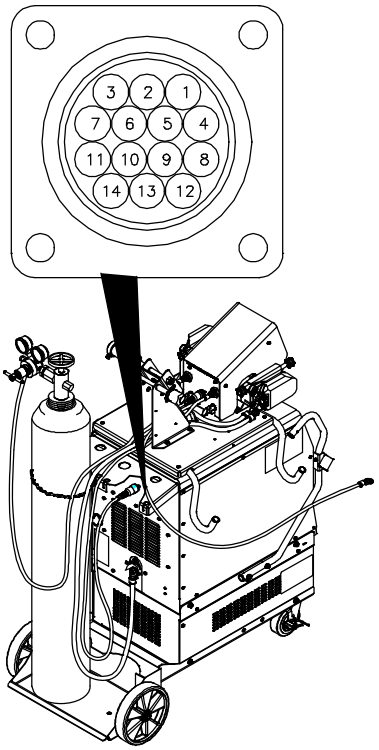
Reinstall wrapper.

Tools Needed:

5/16 in.

805 298-A / 805 429-A

5-6. Remote 14 Wire Feeder Control Receptacle Information



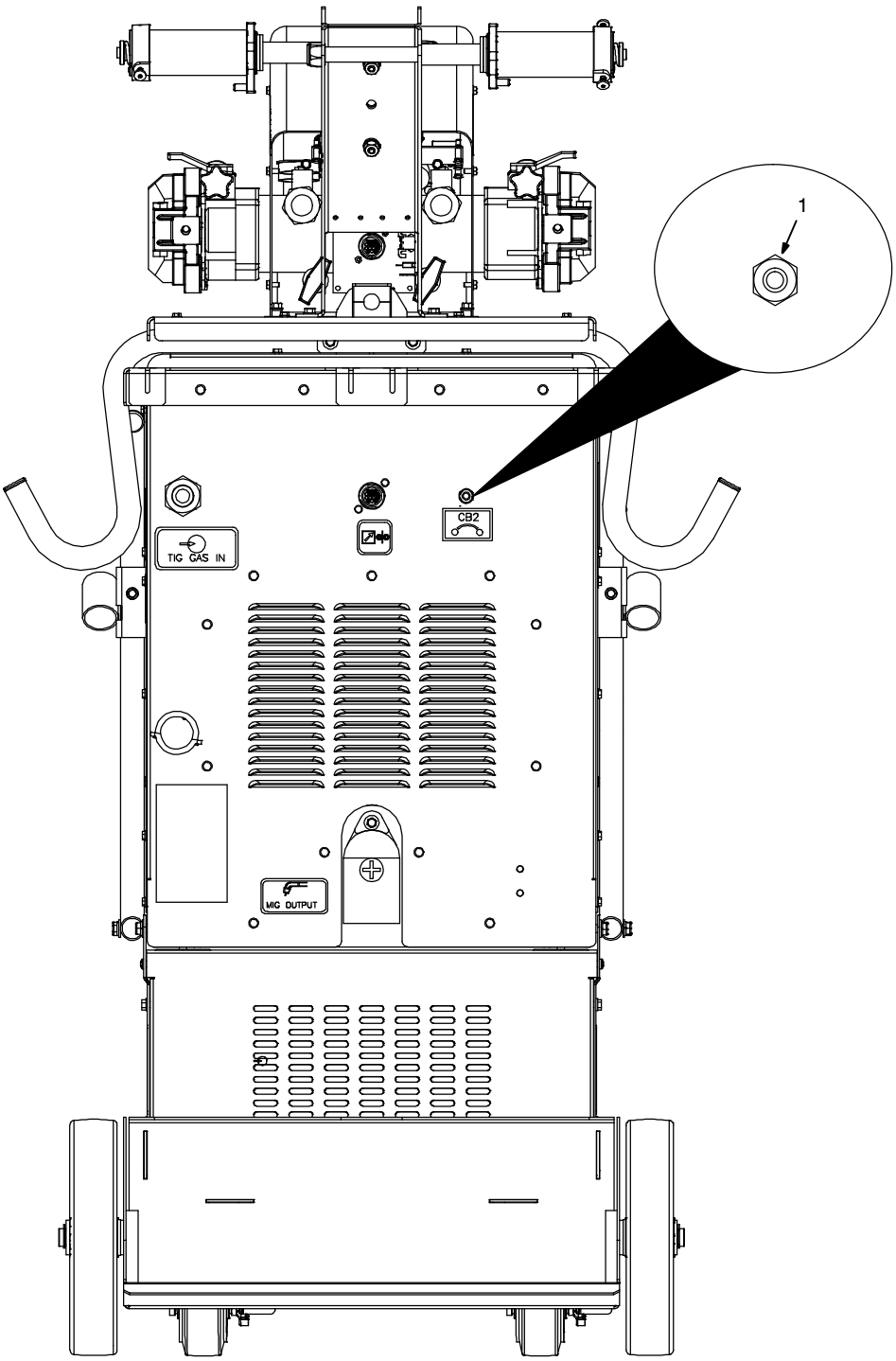
Ref. 805 144-A / Ref. 048 286-B

Remote 14 Feeder Control	Socket*	Socket Information
24 VOLTS AC	8, 12	24 volts AC. Protected by supplementary protector CB2.
	1,4	24 volts AC return. Connected to chassis common. Completes 24 volts AC power supply circuit to feeder.
SERIAL COMMUNICATION	6	Isolated RS-485 (+) serial communication signal.
	3	Isolated RS-485 (–) serial communication signal.
	5	Isolated serial communication common.
POSITIVE VOLT SENSE	14	Positive weld output voltage sense signal.
NEGATIVE VOLT SENSE	11	Negative weld output voltage sense signal.
GND	2,10	Chassis common.

*The remaining sockets are not used.

Notes

5-7. Supplementary Protector CB2



1 Supplementary Protector CB2

CB2 protects the 24 volts ac power supply to the wire feeder (see Section 5-6).

Press button to reset supplementary protector.

254 085-A

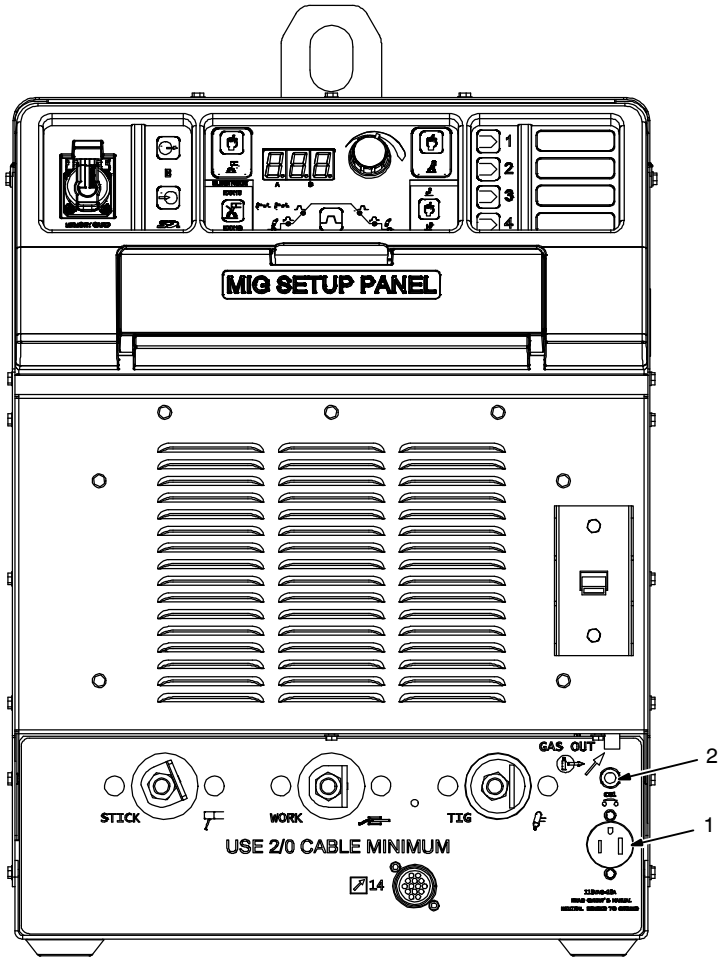
5-8. 115 Volts AC Single Receptacle And Supplementary Protector

1 115 V 10 A AC Receptacle (Cooler Power Supply Only When Power Source Is On)

2 Supplementary Protector CB1

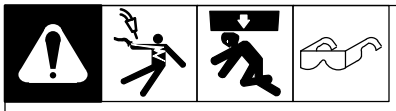
CB1 protects single 115 volt AC receptacle.

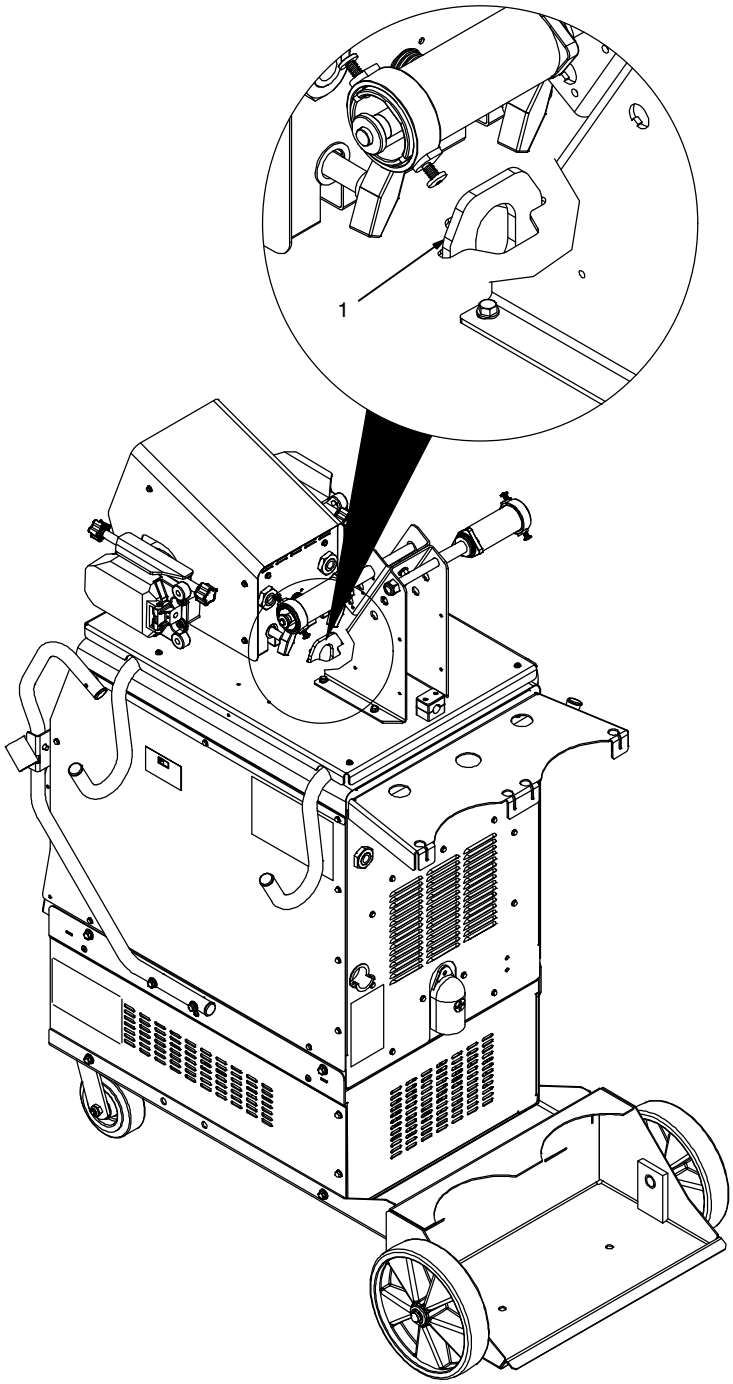
Press button to reset supplementary protector.



254 087-A

5-9. Lifting Eye On Power Source





Turn Off welding power source, disconnect input power.

1 Lifting Eye

The wire feeder allows access to the lifting eye on the power source.

The entire welding system as shown with cable hangers, cooler with coolant, dual feeder, and running gear can be lifted with the lifting eye.

The control cable must be disconnected from the feeder. Use of a lifting strap may be necessary.

Total weight is approximately 525 lb (238 kg) excluding welding guns and cables.

☞ ***Be sure that wire spools, cables and gas bottles are removed before lifting the welding system.***

805 293-A

5-10. Electrical Service Guide

NOTICE *– INCORRECT INPUT POWER can damage this welding power source. This welding power source requires a CONTINUOUS supply of input power at rated frequency (±10%) and voltage (±10%). Phase to ground voltage shall not exceed +10% of rated input voltage. Do not use a generator with automatic idle device (that idles engine when no load is sensed) to supply input power to this welding power source.*

NOTICE *– Actual input voltage should not be 10% less than minimum and/or 10% more than maximum input voltages listed in table. If actual input voltage is outside this range, output may not be be available.*

Failure to follow these electrical service guide recommendations could create an electric shock or fire hazard. These recommendations are for a dedicated circuit sized for the rated output and duty cycle of the welding power source.
In dedicated circuit installations, the National Electrical Code (NEC) allows the receptacle or conductor rating to be less than the rating of the circuit protection device. All components of the circuit must be physically compatible. See NEC articles 210.21, 630.11, and 630.12.

	50/60 Hz Three-Phase	
Input Voltage (V)	380	400
Input Amperes (A) At Rated Output	26.3	25.5
Max Recommended Standard Fuse Rating In Amperes [1]		
Time-Delay Fuses [2]	30	30
Normal Operating Fuses [3]	40	40
Min Input Conductor Size In AWG [4]	10	10
Max Recommended Input Conductor Length In Feet (Meters)	215 (66)	237 (72)
Min Grounding Conductor Size In AWG [4]	10	10

Reference: 2011 National Electrical Code (NEC) (including article 630)

1 If a circuit breaker is used in place of a fuse, choose a circuit breaker with time-current curves comparable to the recommended fuse.

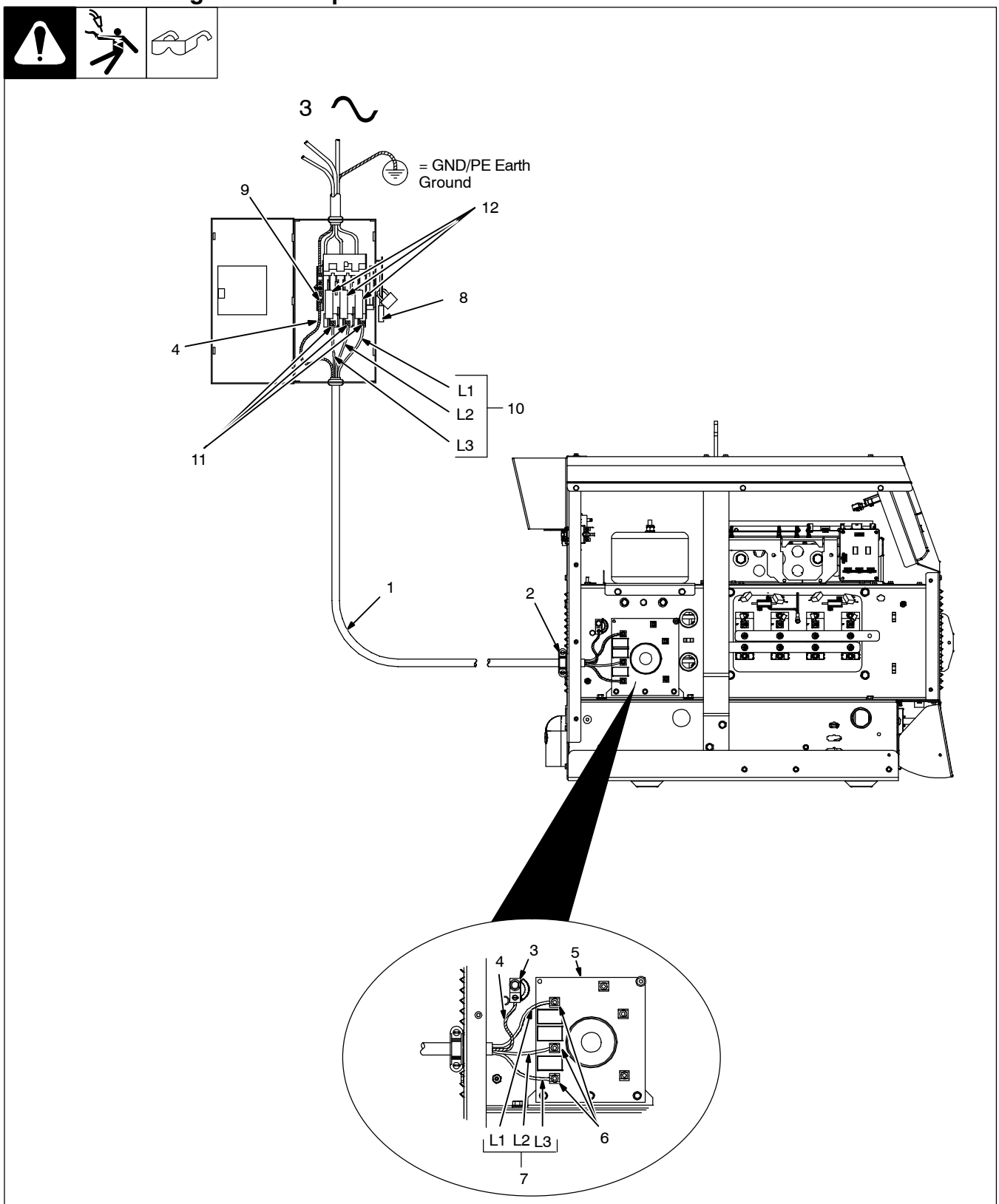
2 “Time-Delay” fuses are UL class “RK5” . See UL 248.

3 “Normal Operating” (general purpose - no intentional delay) fuses are UL class “K5” (up to and including 60 amp), and UL class “H” (65 amp and above).

4 Conductor data in this section specifies conductor size (excluding flexible cord or cable) between the panelboard and the equipment per NEC Table 310.15(B)(16). If a flexible cord or cable is used, minimum conductor size may increase. See NEC Table 400.5(A) for flexible cord and cable requirements.

Notes

5-11. Connecting 3-Phase Input Power

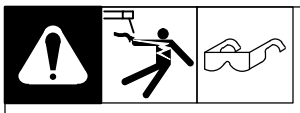


Tools Needed:

5/16 in.

Input3 2011–03 – 254 080-A

5-11. Connecting 3-Phase Input Power (Continued)



Installation must meet all National and Local Codes – have only qualified persons make this installation.

Disconnect and lockout/tagout input power before connecting input conductors from unit. Follow established procedures regarding the installation and removal of lockout/tagout devices.

Make input power connections to the welding power source first.

Always connect green or green/yellow conductor to supply grounding terminal first, and never to a line terminal.

See rating label on unit and check input voltage available at site.

☞ *Right side panel can be removed to allow attaching primary cable even with handles installed.*

1 Input Power Conductors (Customer Supplied Cord)

Select size and length of conductors using Section 5-10. Conductors must comply with national, state, and local electrical codes. If applicable, use lugs of proper amperage capacity and correct hole size.

Welding Power Source Input Power Connections

2 Strain Relief

Route conductors (cord) through strain relief and tighten screws.

3 Welding Power Source Grounding Terminal

4 Green Or Green/Yellow Grounding Conductor

5 Reed Switch (Ground Current Sensor) (Optional)

Connect green or green/yellow grounding conductor to welding power source grounding terminal first. If unit is equipped with optional ground current sensor, route grounding conductor through reed switch two times and connect to grounding terminal.

6 Welding Power Source Line Terminals

7 Input Conductors L1 (U), L2 (V) And L3 (W)

Connect input conductors L1 (U), L2 (V) and L3 (W) to welding power source line terminals.

Reinstall right side panel on welding power source.

Disconnect Device Input Power Connections

8 Disconnect Device (switch shown in OFF position)

9 Disconnect Device (Supply) Grounding Terminal

10 Disconnect Device Line Terminals

Connect green or green/yellow grounding conductor to disconnect device grounding terminal first.

Connect input conductors L1 (U), L2 (V) And L3 (W) to disconnect device line terminals.

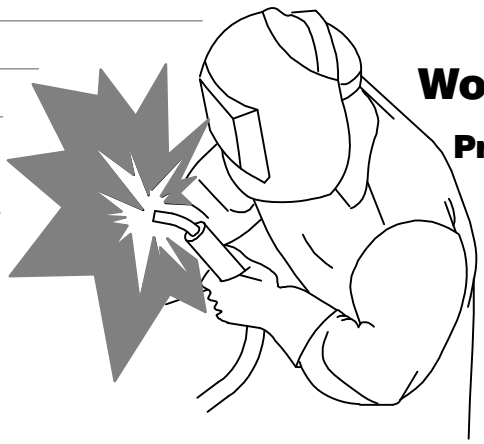
11 Over-Current Protection

Select type and size of over-current protection using Section 5-10 (fused disconnect switch shown).

Close and secure door on line disconnect device. Follow established lockout/tagout procedures to put unit in service.

input3 2012–05

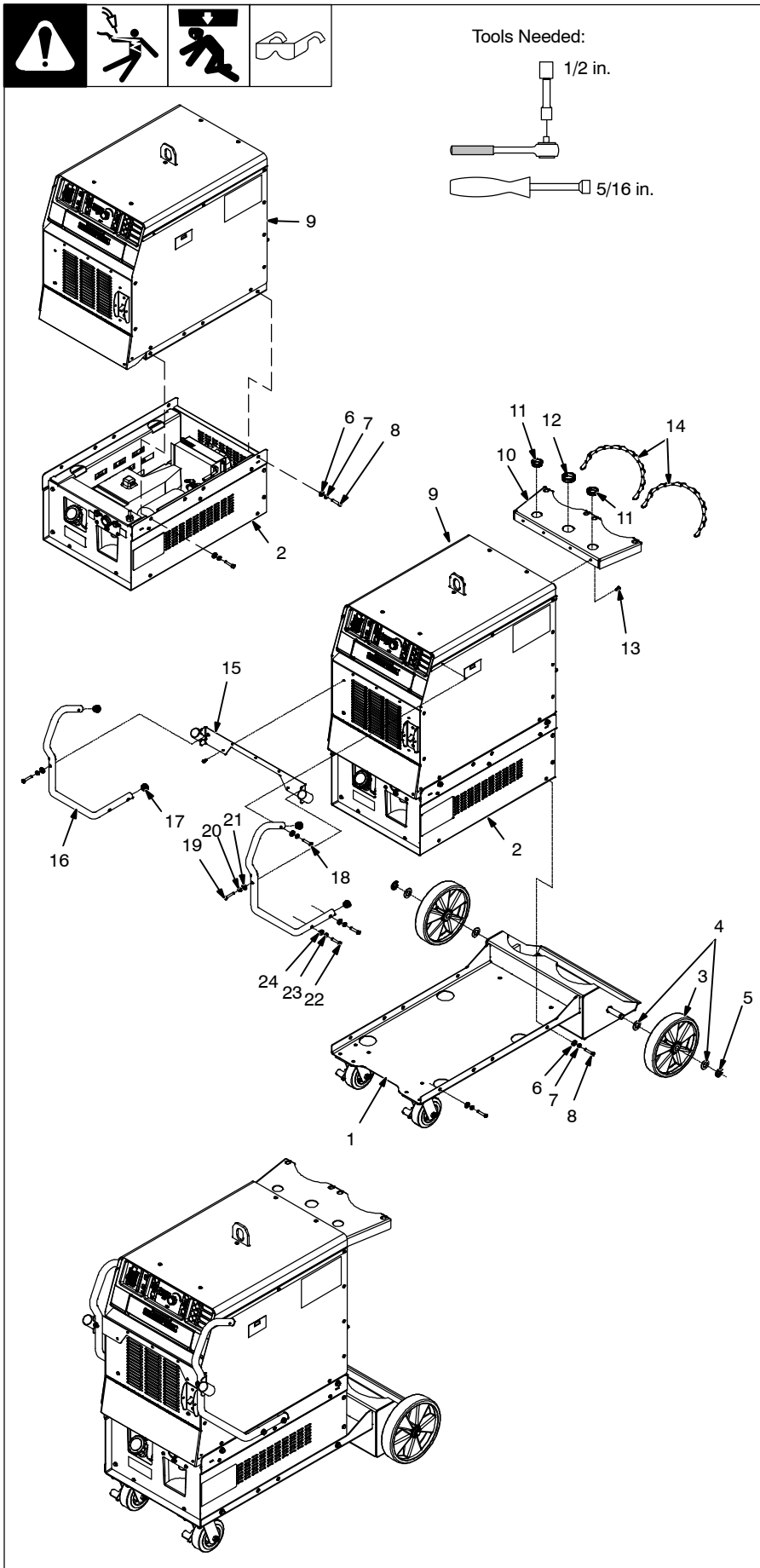
Notes



Work like a Pro!

Pros weld and cut safely. Read the safety rules at the beginning of this manual.

5-12. Installing Optional Handles, Running Gear And Cooler



Turn Off welding power source, disconnect input power.

1 Running Gear 234 359

2 Cooler

3 Wheel 163 463 (2)

4 Flat Washer 602 250 (4)

5 Retaining Ring 121 614 (2)

Install wheels on cylinder tray as shown.

Set cooler on running gear.

☞ *If not installing a cooler, set power source on running gear.*

6 Flat Washer 602 240 (4)

7 Lock Washer 602 211 (4)

8 Screw 601 944 (4)

Secure cooler to running gear using supplied flat washers, lock washers and screws.

9 Power Source

Set power source on cooler.

Secure power source to cooler using same hardware that was used to secure cooler to running gear.

10 Cylinder Support Bracket

11 Bushing 170 647 (2)

12 Bushing 004 214 (1)

13 Screw 128 237 (4)

14 Chain 188 441 (2)

Install cylinder support bracket to rear of power source and secure with supplied screws. Install bushings and chains.

15 Handle Bracket

16 Handle (2)

17 Tube Cap (4)

Install tube caps into ends of handles.

Remove 5 screws above louvered panel on front of power source.

Attach handle bracket to front of power source using the 5 screws previously removed.

Remove 2 screws on the side of the cover on front of power source.

18 Screw 234 483 (2)

Start supplied upper handle mounting screws into handles by hand on each side of power source.

19 Screw 604 535 (2)

20 Lock Washer 602 211 (2)

21 Flat Washer 602 240 (2)

Start supplied screws, lock washers and flat washers into handle bracket by hand on each side of power source.

22 Screw 604 535 (4)

23 Lock Washer 602 211 (4)

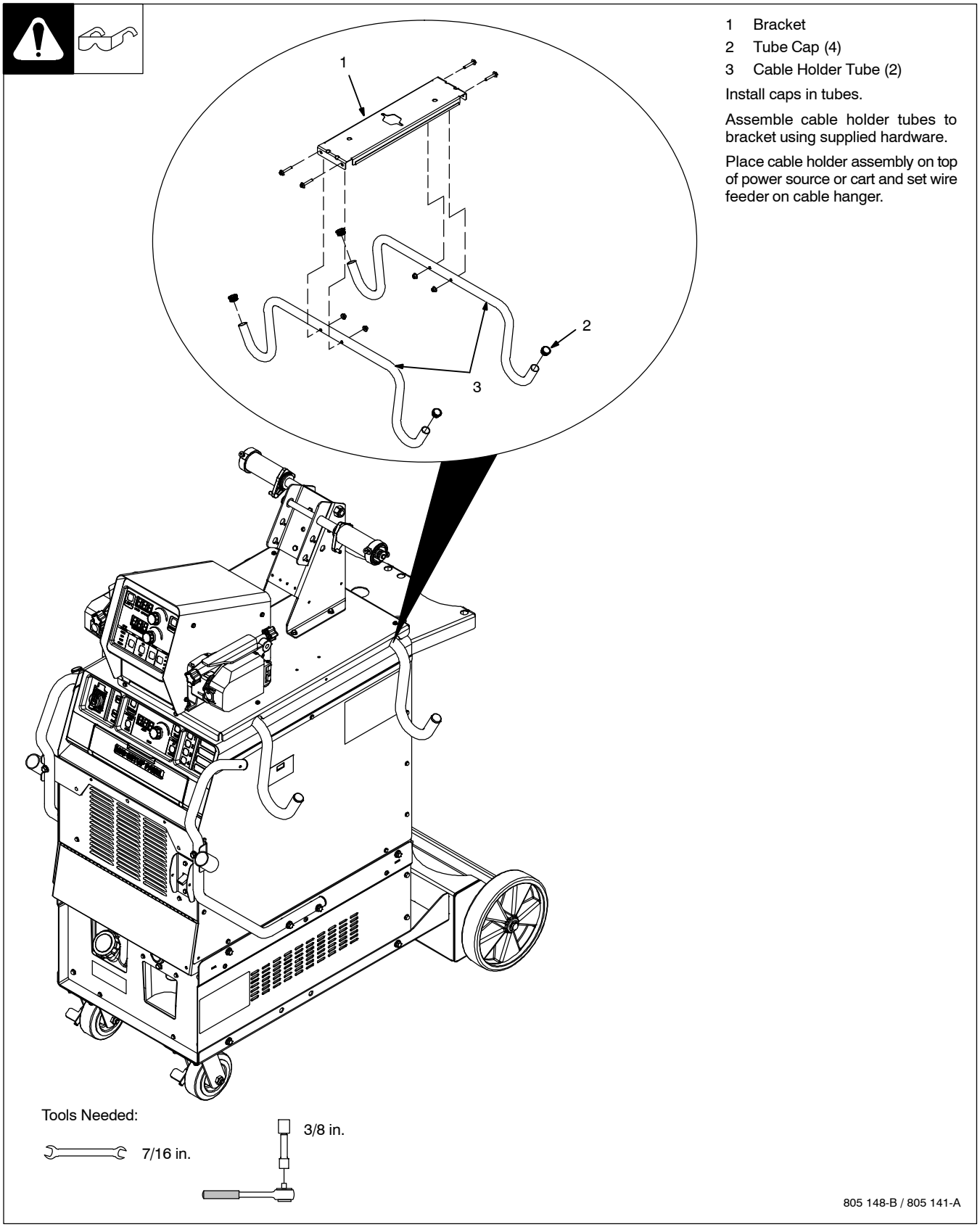
24 Flat Washer 602 240 (4)

Start supplied lower handle mounting screws, lock washers and flat washers into handles by hand on each side of power source.

Tighten all handle hardware.

805 302-A / 805 292-A

5-13. Assembling And Installing Cable Hanger



1 Bracket
2 Tube Cap (4)
3 Cable Holder Tube (2)

Install caps in tubes.

Assemble cable holder tubes to bracket using supplied hardware.

Place cable holder assembly on top of power source or cart and set wire feeder on cable hanger.

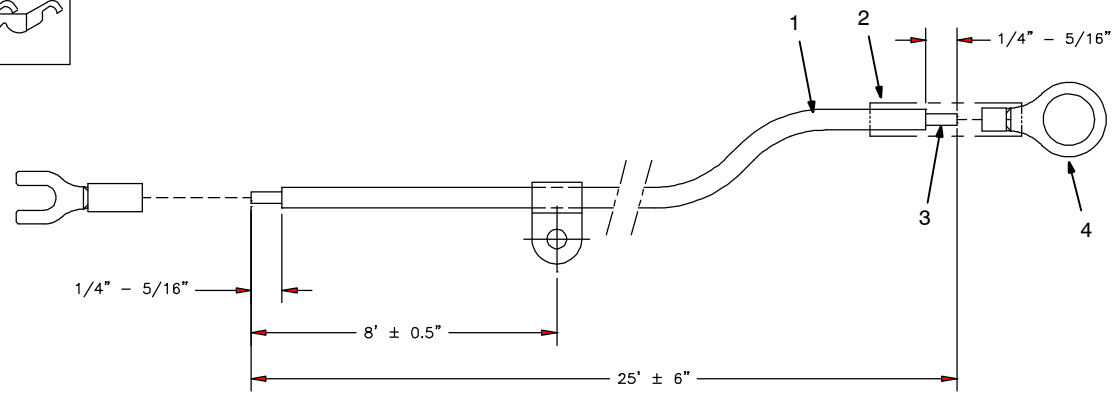
Tools Needed:

7/16 in.

3/8 in.

805 148-B / 805 141-A

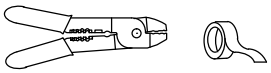
5-14. Proper Ring Terminal Connection To Volt Sense Lead



If volt sense lead is cut or broken at end with ring terminal, be sure that new ring terminal is connected as shown.

1 Jacket
2 Insulated Tape Or Heat-Shrink Tubing
3 Center Conductor 10 ga
4 Ring Terminal 1/2 in. Opening

Tools Needed:

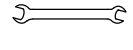


Ref. 239 780-B

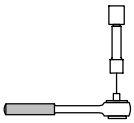
5-15. Connecting Volt Sense Lead And Work Cable To Clamp

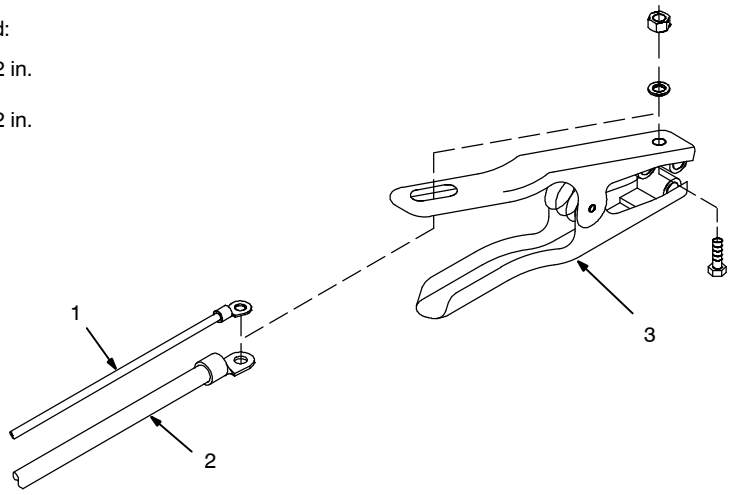
Tools Needed:

1/2 in.



1/2 in.





1 Volt Sense Lead
2 Work Cable
3 Clamp

☞ *Be sure that volt sense lead ring terminal is on top of work cable ring terminal when connecting to clamp.*

Connect volt sense lead and work cable to clamp.

805 030-A

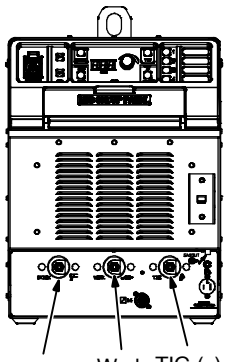
5-16. Weld Output Terminals And Selecting Cable Sizes* Recommended For PipeWorx 400

NOTICE *– The Total Cable Length in Weld Circuit (see table below) is the combined length of both weld cables. For example, if the power source is 100 ft (30 m) from the workpiece, the total cable length in the weld circuit is 200 ft (2 cables x 100 ft). Use the 200 ft (60 m) column to determine cable size.*

Weld Output Terminals

Turn off power before connecting to weld output terminals.

Do not use worn, damaged, undersized, or poorly spliced cables.



805 143-A

Welding Amperes	Weld Cable Size** and Total Cable (Copper) Length in Weld Circuit Not Exceeding***						
	100 ft (30 m) or Less	150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 – 100% Duty Cycle						
100	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70
150	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70)	3/0 (95)	3/0 (95)
200	2/0 (70)	2/0 (70)	2/0 (70)	2/0 (70)	3/0 (95)	4/0 (120)	4/0 (120)
250	2/0 (70)	2/0 (70)	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 2/0 (2x70)
300	2/0 (70)	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 3/0 (2x95)
350	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)
400	2/0 (70)	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)	2 ea. 4/0 (2x120)
500	3/0 (95)	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)	3 ea. 3/0 (3x95)	3 ea. 3/0 (3x95)
600	4/0 (120)	2 ea. 2/0 (2x70)	2 ea. 3/0 (2x95)	2 ea. 4/0 (2x120)	3 ea. 3/0 (3x95)	3 ea. 4/0 (3x120)	3 ea. 4/0 (3x120)

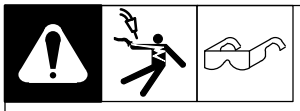
* This chart is a general guideline and may not suit all applications. If cable overheats, use next size larger cable.

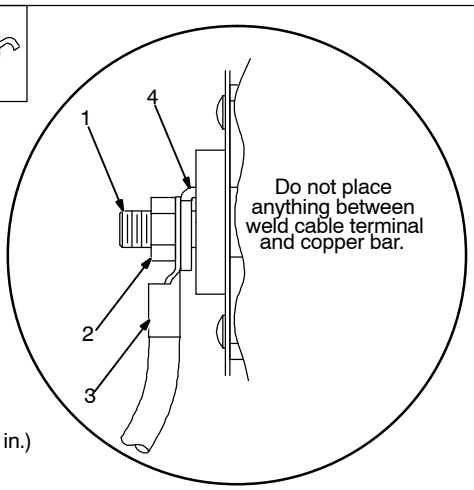
**Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of at least 300 circular mils per ampere.
( ) = mm^2 for metric use.

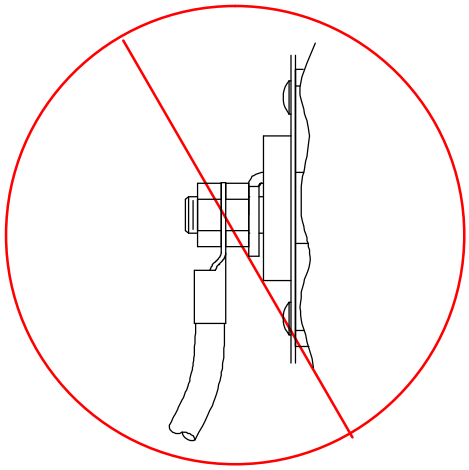
***For distances longer than those shown in this guide, call a factory applications rep. at 920-735-4505 (Miller) or 1-800-332-3281 (Hobart)

Ref. S-0007-G 2009–08

5-17. Connecting Weld Output Cables







Incorrect Installation

803 778-B

Tools Needed:

19 mm (3/4 in.)

Turn off power before connecting to weld output terminals.

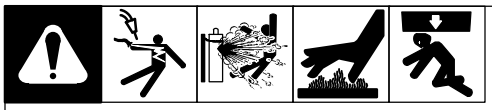
Failure to properly connect weld cables may cause excessive heat and start a fire, or damage your machine.

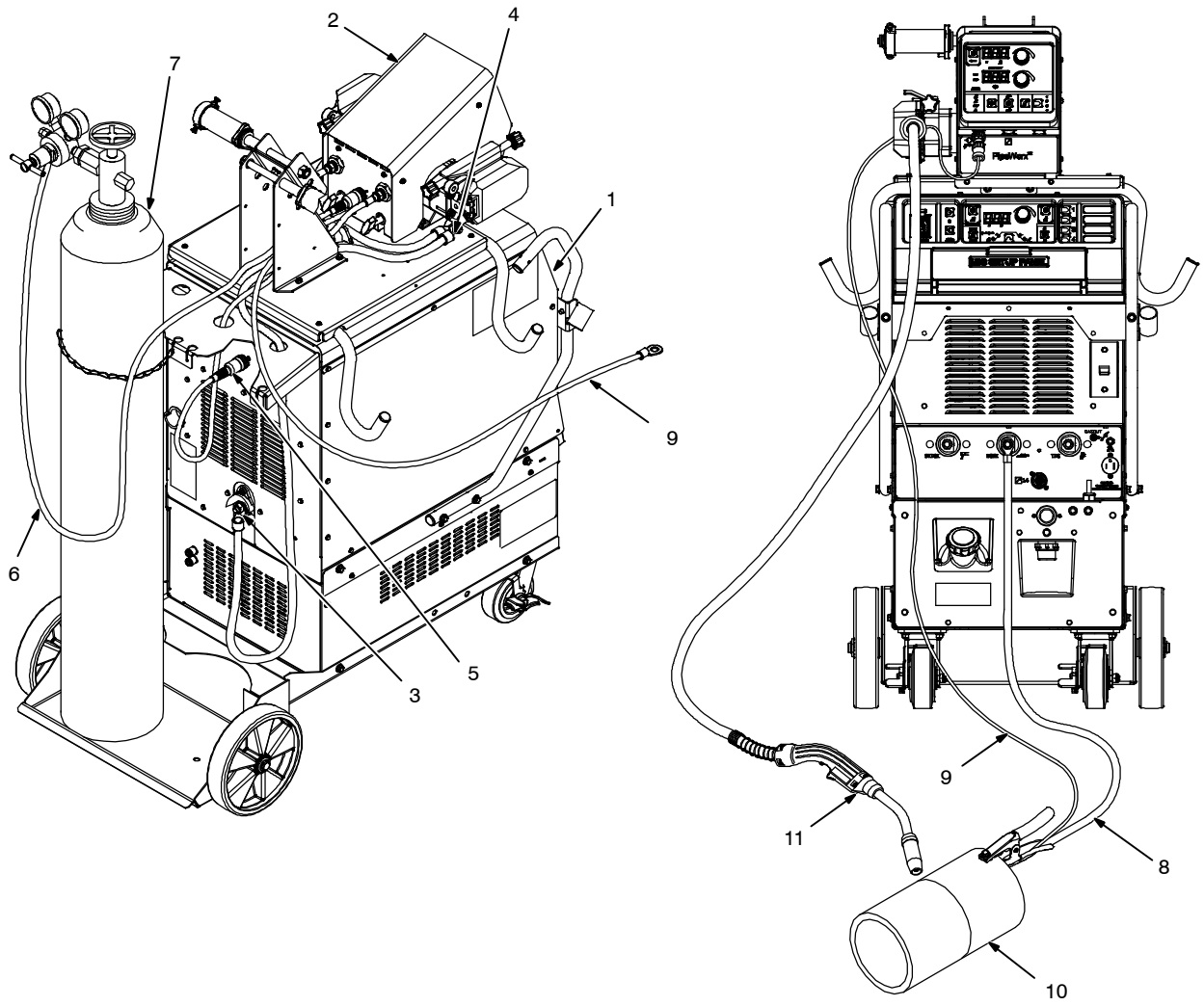
1 Weld Output Terminal
2 Supplied Weld Output Terminal Nut
3 Weld Cable Terminal
4 Copper Bar

Remove supplied nut from weld output terminal. Slide weld cable terminal onto weld output terminal and secure with nut so that weld cable terminal is tight against copper bar. **Do not place anything between weld cable terminal and copper bar. Make sure that the surfaces of the weld cable terminal and copper bar are clean.**

Notes

5-18. Typical Connection Diagram For MIG (GMAW) Equipment With Feeder On Power Source





254 079-A

⚠ **Do not put feeder where welding wire hits cylinder.**

⚠ **Do not move or operate equipment when it could tip.**

1 Welding Power Source

2 Wire Feeder

3 MIG Connection

4 Positive (+) Weld Cable

5 Feeder Control Cable Connection

6 Gas Hose

7 Gas Cylinder

Connect 14-pin plug to rear of power source, and connect 14-socket plug to rear of wire feeder. Connect one end of weld cable to weld terminal on rear of power source. Connect remaining end of weld cable to wire feeder drive housing. Connect one end of gas hose to regulator/flowmeter on gas cylinder and connect remaining end of gas hose to gas solenoid connector on rear of feeder or Y-hose for dual wire feeder.

8 Work (–) Weld Cable

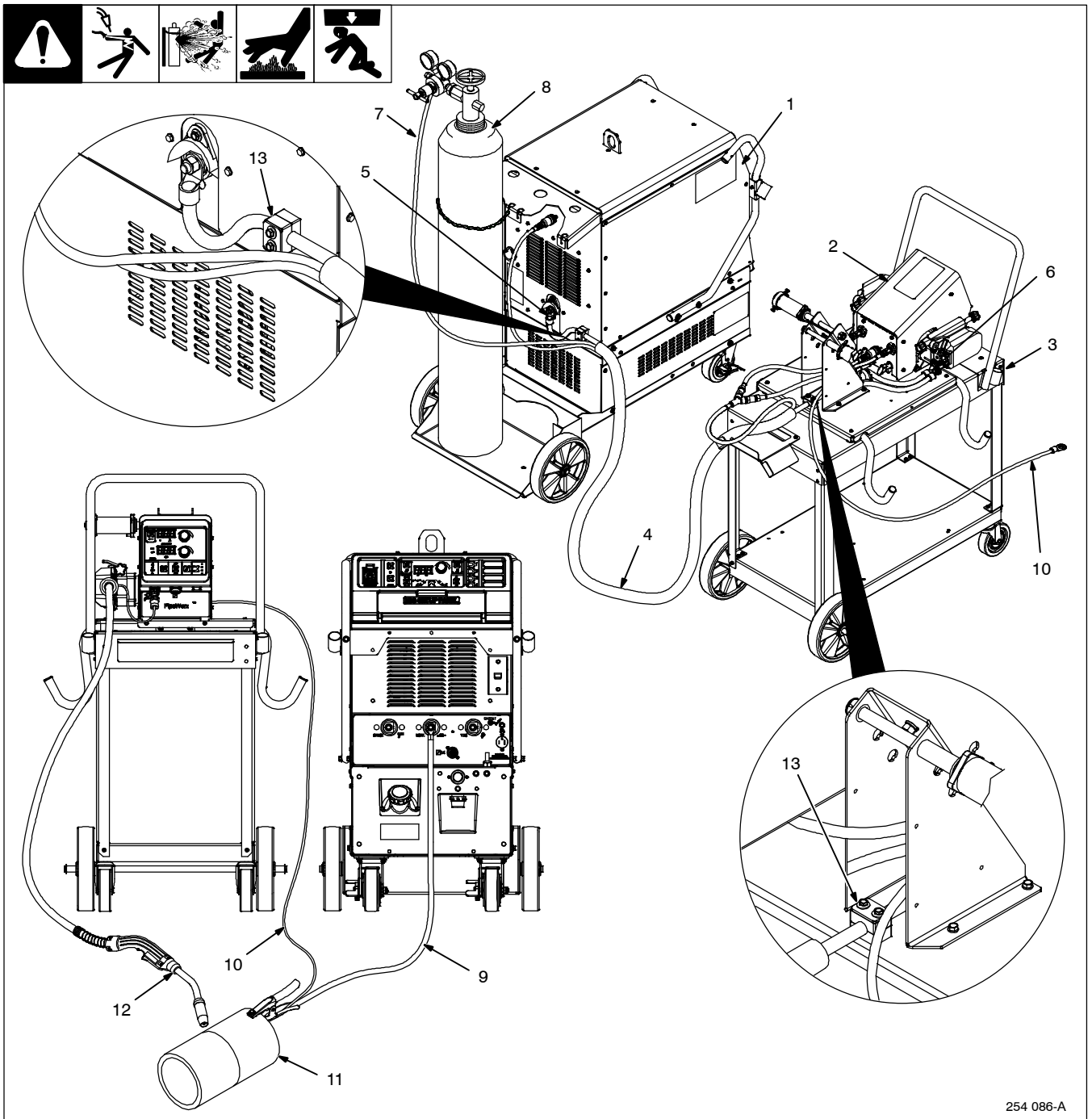
☞ *Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.*

9 Volt Sense Cable

10 Workpiece

11 Welding Gun

5-19. Typical Connection Diagram For MIG (GMAW) Equipment With Feeder On Cart



⚠ **Do not put feeder where welding wire hits cylinder.**

⚠ **Do not move or operate equipment when it could tip.**

1 Welding Power Source

2 Wire Feeder

3 Feeder Cart

4 Composite Cable

5 MIG Connection

6 Positive (+) Weld Cable

7 Gas Hose

8 Gas Cylinder

Locate end of composite cable where gas hose extends out of sleeve approximately 50 inches (1270 mm). This end of the composite cable connects to the power source. Connect 14-pin plug to rear of power source, and connect 14-socket plug to rear of wire feeder. Connect one end of weld cable to weld terminal on rear of power source and secure cable in clamp block on rear panel. Connect remaining end of weld cable to wire feeder drive housing and secure cable in clamp block on feeder base. Connect one end of gas hose to regulator/flowmeter on gas cylinder and connect remaining end of gas hose to gas solenoid connector on rear of feeder or Y-hose for dual wire feeder.

9 Work (–) Weld Cable (2/0 minimum)

☞ *Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.*

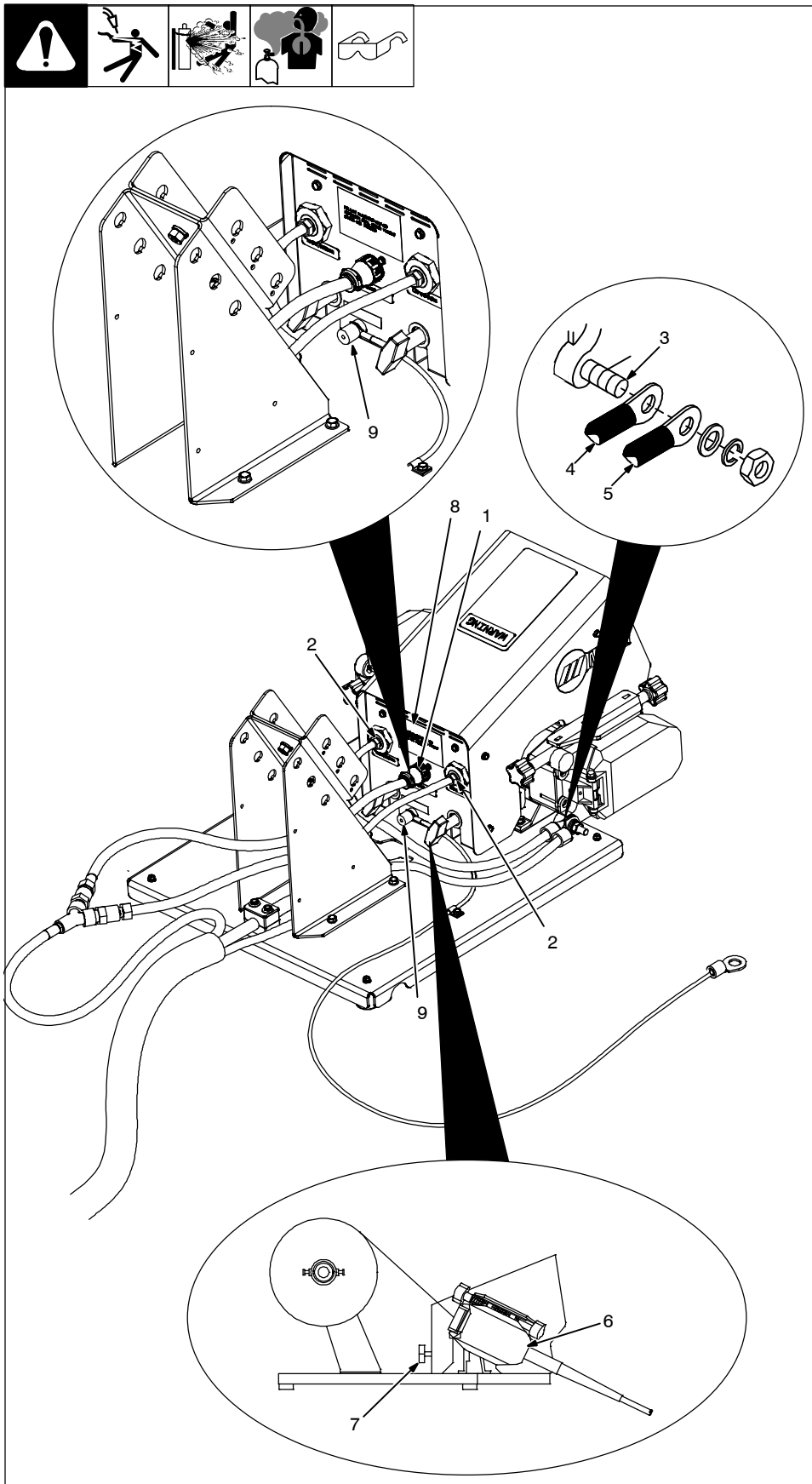
10 Volt Sense Cable

11 Workpiece

12 Welding Gun

13 Strain Relief Clamp

5-20. Wire Feeder Rear Panel Connections And Rotating Drive Assembly



1 14-Pin Control Cable

2 Shielding Gas Valve Fittings

Requires fitting with 5/8-18 right-hand threads. Connect customer-supplied gas hose.

3 Weld Cable Terminal

4 Jumper Weld Cable From Right Side Drive Assembly (Dual Model Only)

5 Weld Cable

6 Drive Assembly

7 Drive Assembly Rotation Knob

To rotate the drive assembly, loosen drive assembly rotation knob, rotate drive assembly, and tighten knob.

8 Rating Label Location

9 Volt Sense Terminal

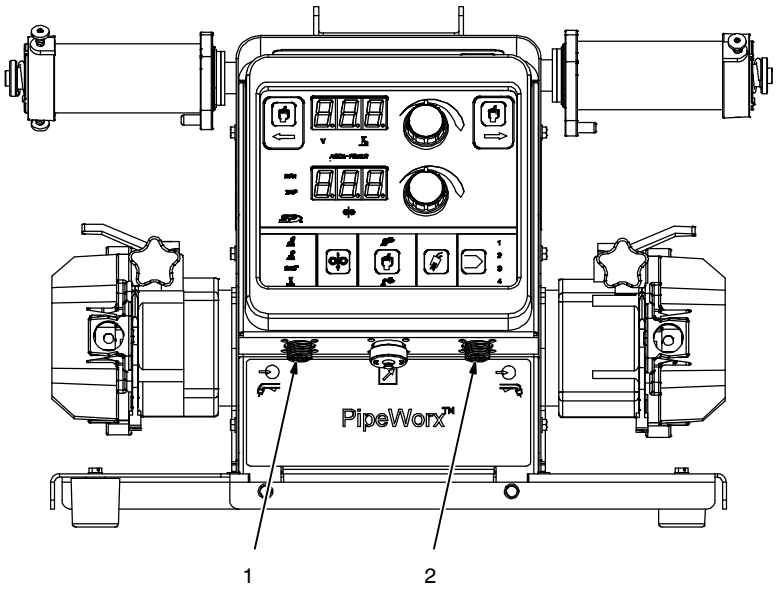
Tools Needed:

9/16, 5/8 in.

3/16 in.

805 155-A / Ref. 804 766-A / 802 825-A

5-21. Gun Trigger Receptacle



1 Left Gun Trigger Receptacle RC2

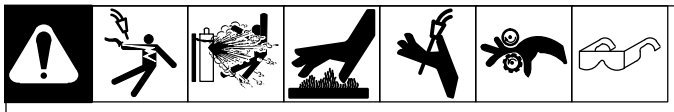
2 Right Gun Trigger Receptacle RC3 (Dual Model Only)

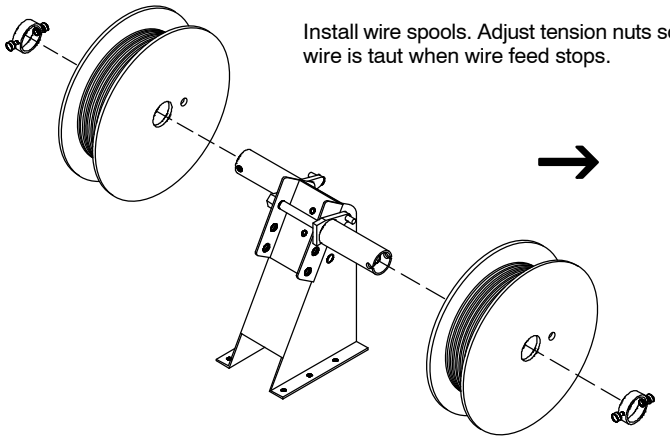
Connect gun trigger plug to appropriate receptacle on feeder.

254 083-A

Notes

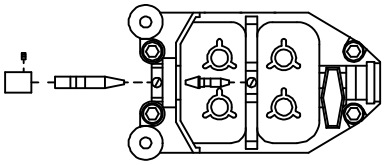
5-22. Installing And Threading Welding Wire



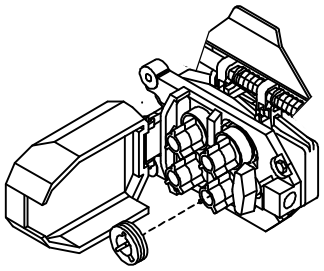


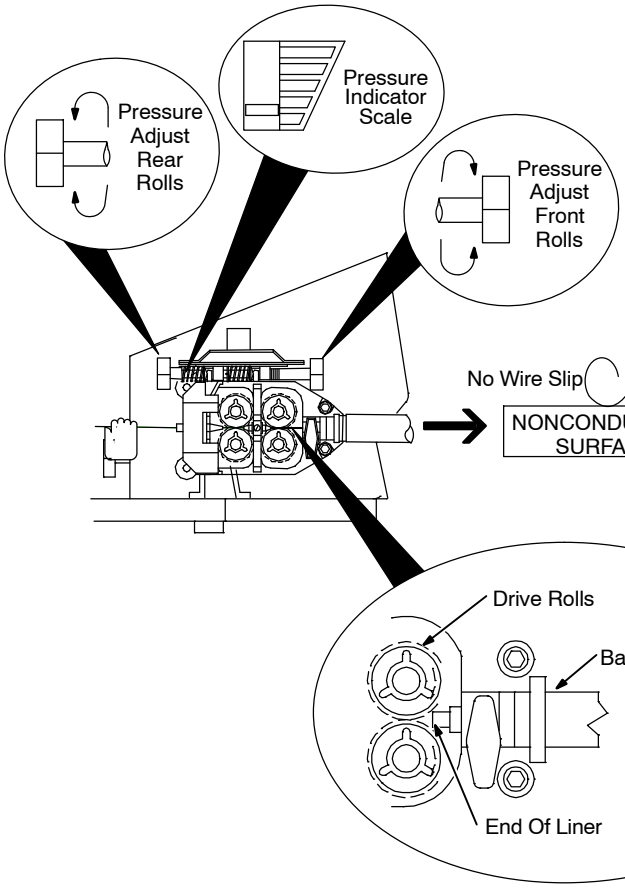
Install wire spools. Adjust tension nuts so wire is taut when wire feed stops.

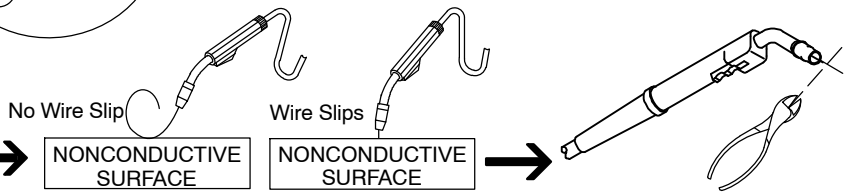
Install wire guides and anti-wear guide.

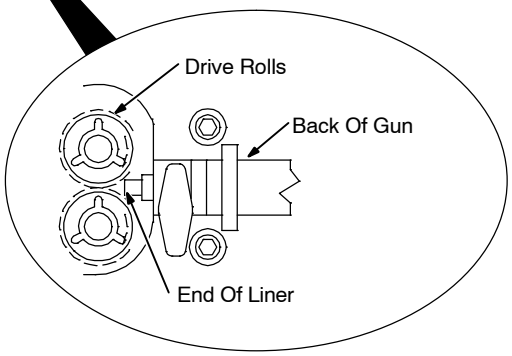


Install drive rolls.

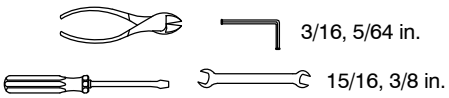








Tools Needed:



☞ *For best wire feeding performance, be sure that the outlet cable has the proper size liner for the welding wire size being used. Also, when the gun is installed, the liner extending from the back of the gun should be as close to the drive rolls as possible, without touching.*

Install gun. Lay gun cable out straight. Cut off end of wire. Push wire through guides up to drive rolls; continue to hold wire. Press Jog button to feed wire out gun.

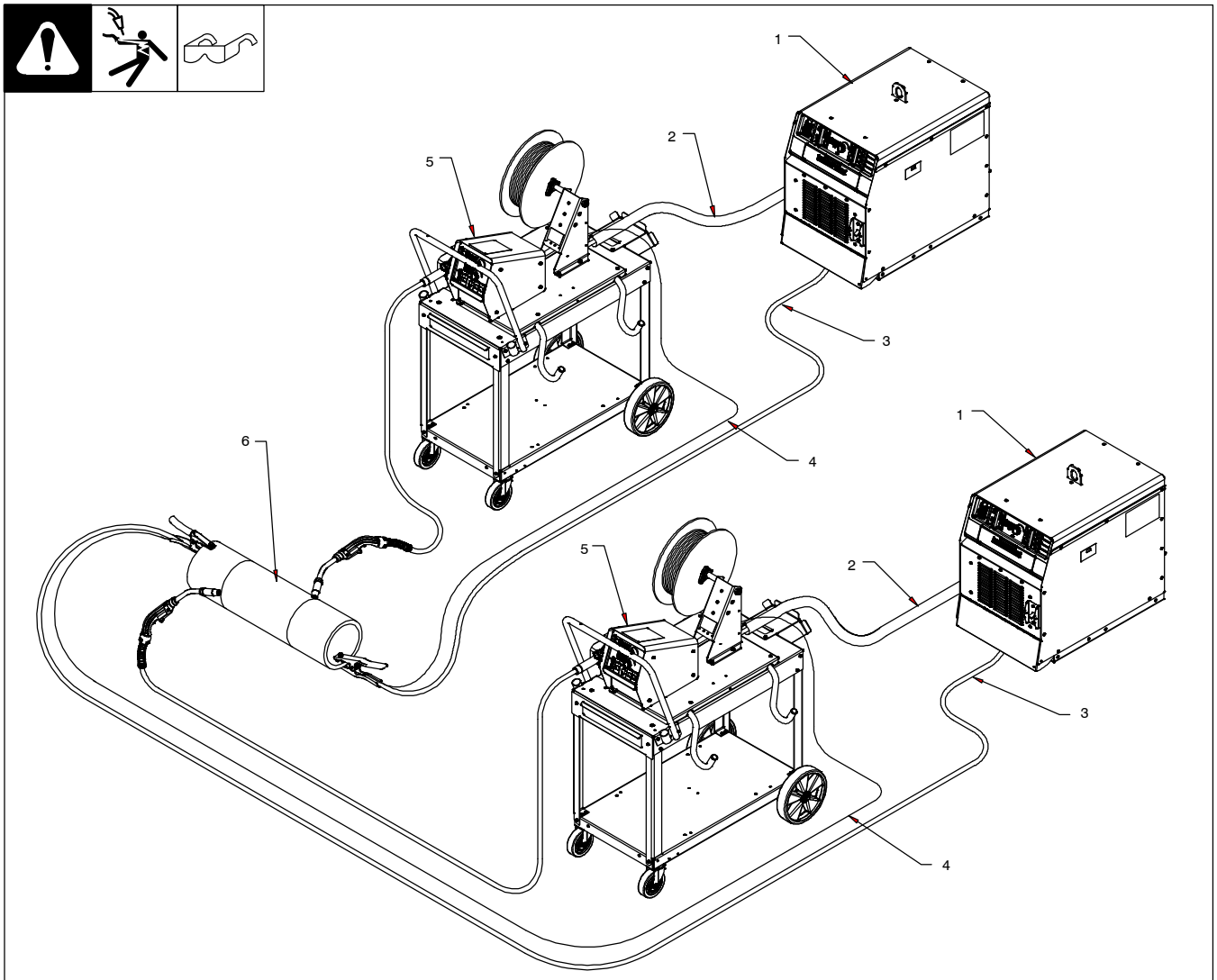
☞ *For soft wire or small diameter stainless steel wire, reduce drive roll pressure on the rear roll to half that of the front rolls.*

☞ To adjust drive roll pressure, hold nozzle about 2 in (51 mm) from nonconductive surface and press gun trigger to feed wire against surface. Tighten knob so wire does not slip. Do not overtighten. If contact tip is completely blocked, wire should slip at the feeder (see pressure adjustment above).Cut wire off. Close cover.

Ref. 156 929-A / Ref. 150 922 / Ref. 156 930 / 804 743-A

5-23. Voltage Sensing Lead And Work Cable Connections For Multiple Welding Arcs

A. Ideal Setup



805 289-B

1 Welding Power Source
2 Composite Cable
3 Work Cable
4 Volt Sense Lead

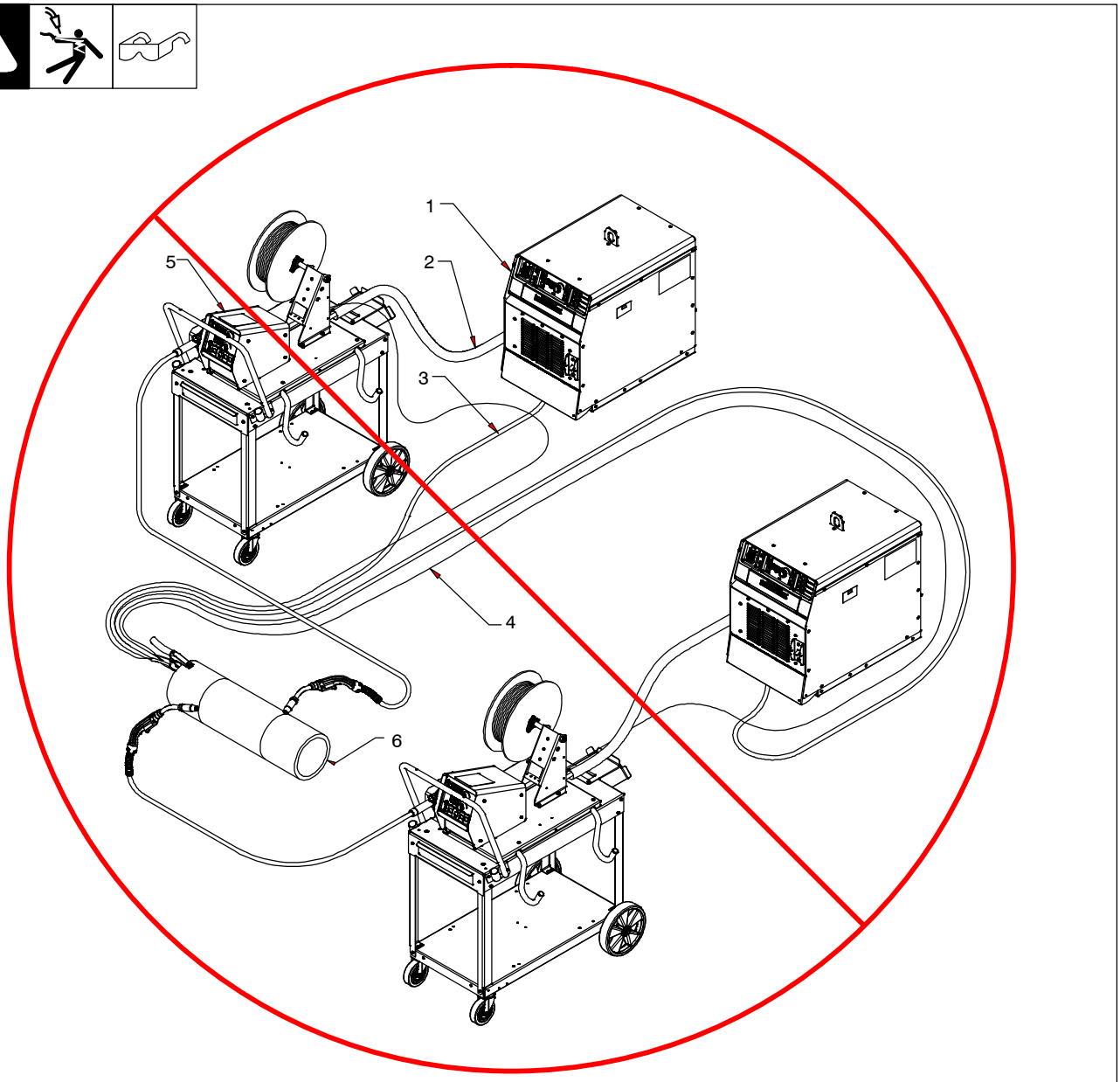
The volt sense lead must be used to provide an accurate voltage feedback signal to the welding system. Use of this lead is critical for stable welding performance.

5 Wire Feeder

6 Workpiece

This arrangement is an ideal setup for supporting separate voltage feedback to the welding power sources. The most accurate voltage sensing may not be achieved due to voltage drops in the workpiece. This may require compensation in the welding parameters.

B. Bad Setup



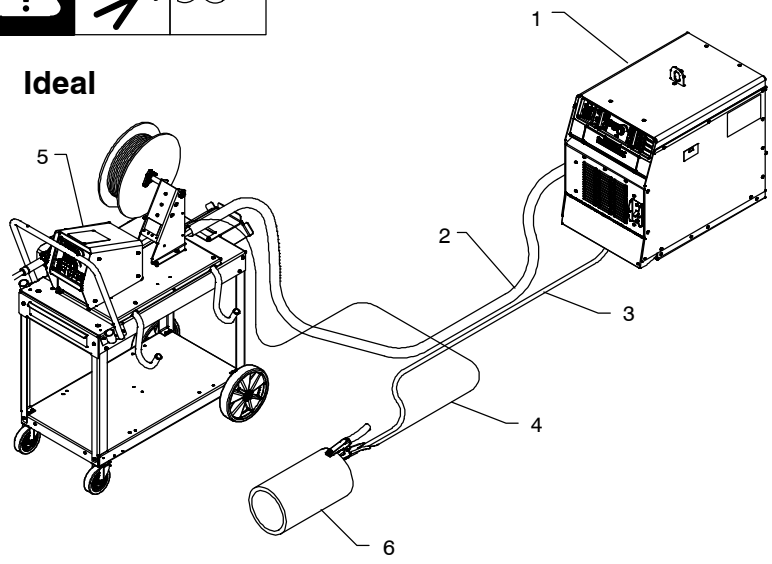
805 290-B

1 Welding Power Source
2 Composite Cable
3 Work Cable
4 Voltage Sensing Lead
5 Wire Feeder
6 Workpiece

This arrangement is a bad setup due to sensing leads being directly in the current flow path of the welding arc. Interaction between welding circuits will affect voltage drop in the workpiece. The voltage drop across the workpiece will not be measured correctly for the voltage feedback signal. Voltage feedback to the welding power sources will not be correct at either sense lead and result in poor arc starts and arc quality.

5-24. Arranging Welding Cables To Reduce Welding Circuit Inductance

Ideal



1 Welding Power Source
2 Composite Cable
3 Work Cable
4 Volt Sense Lead
5 Wire Feeder
6 Workpiece

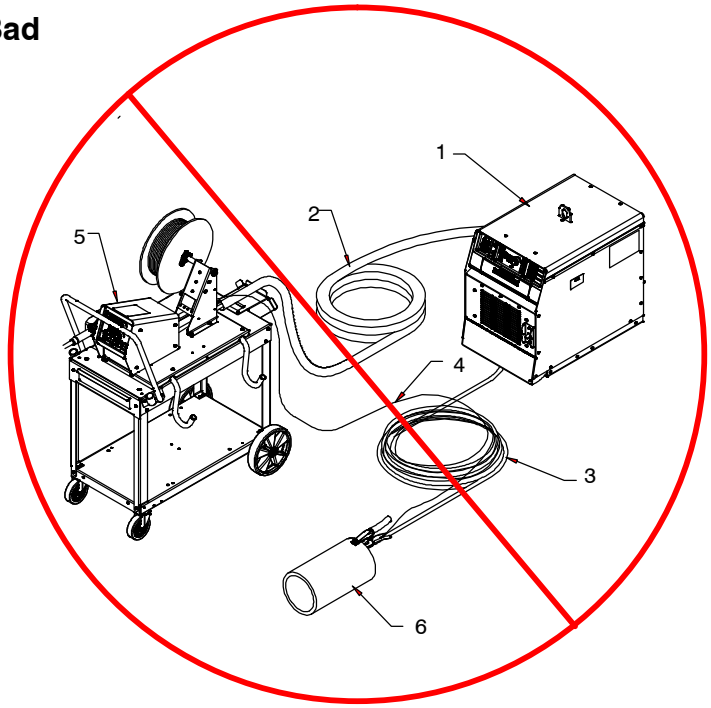
The method used to arrange cables has a significant affect on welding performance. As an example, Pro-Pulse and RMD welding processes can produce high welding circuit inductance depending on cable length and arrangement. This can result in limited current rise during droplet transfer into the welding puddle.

The electrode sense and volt sense leads are contained in the feeder control cable and are enabled for all processes. The volt sense lead automatically compensates for work cable voltage drop when connected to the welding power source.

Do not coil excess cables. Use cables that are the appropriate length for the application. Avoid coupling the volt sense lead with the weld cables.

- Use shortest cables possible for the job
- Use proper sized work clamp and weld cables to accommodate peak amperages
- Separate volt sense lead and feeder control cable from weld cables
- Place weld cables together if possible
- Connect work clamp as close to welding arc as possible

Bad



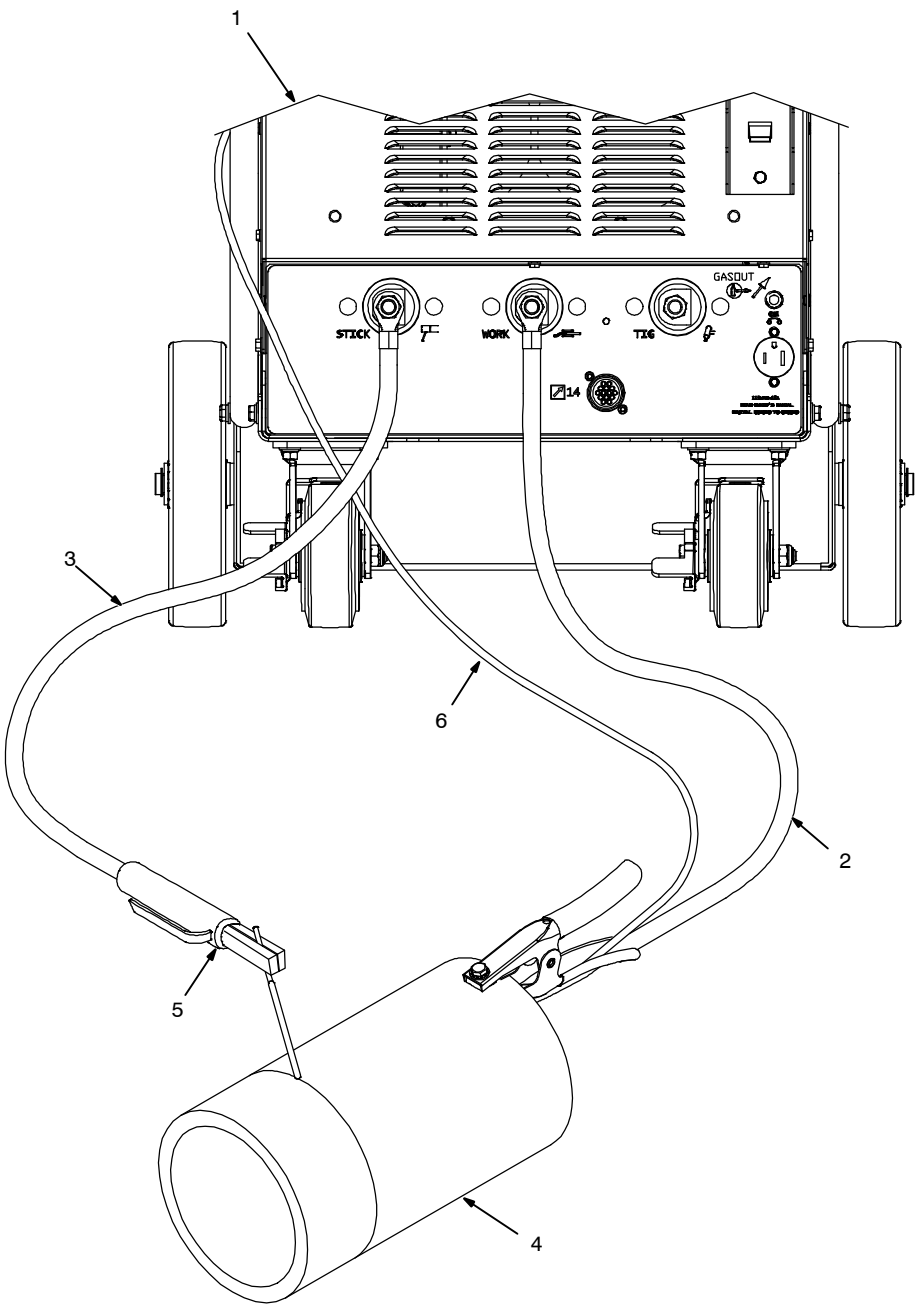
- DO NOT coil cables
- DO NOT share work clamps (no more than 1 machine per clamp)
- DO NOT tangle cables from different machines
- DO NOT splice weld cables

805 291-B

5-25. Typical Connection Diagram For Stick (SMAW) Equipment

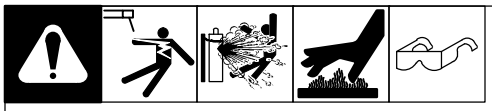
1 Welding Power Source
2 Work (–) Weld Cable
3 Stick (+) Weld Cable
4 Workpiece
5 Electrode Holder
6 Volt Sense Lead

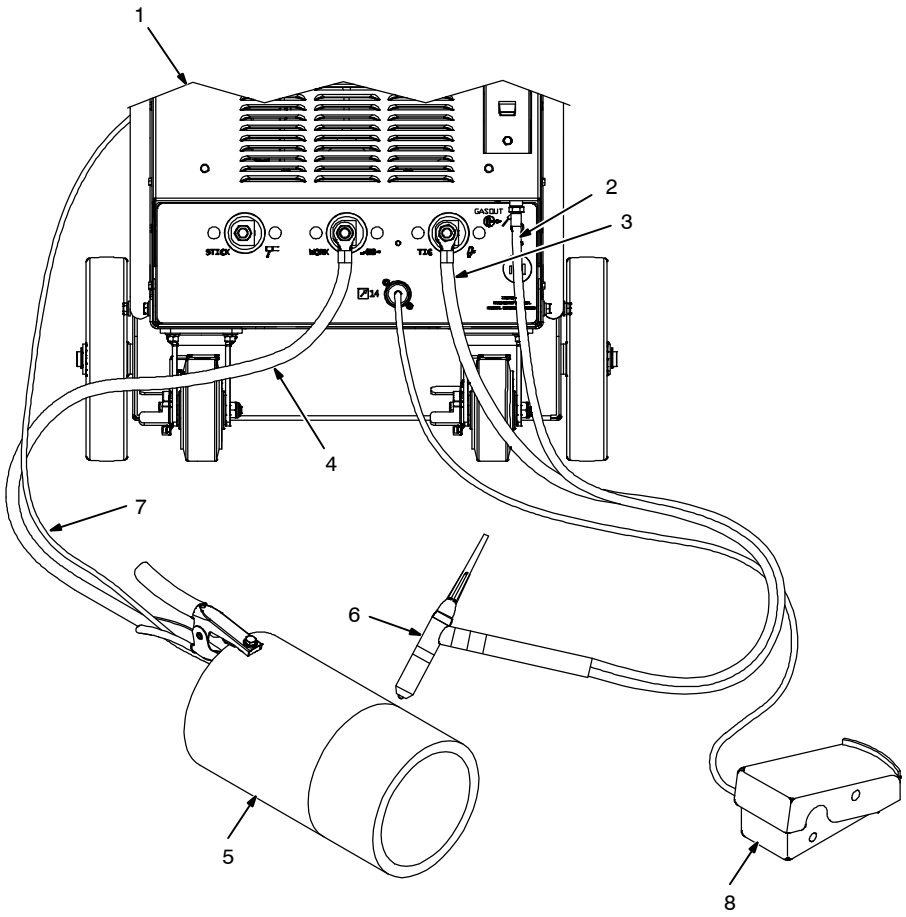
☞ *Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.*



805 294-A

5-26. Typical Connection Diagram For Two Piece Air-Cooled TIG (GTAW) Torch (Using Gas Solenoid Inside Power Source)



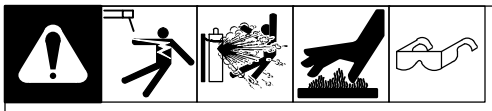


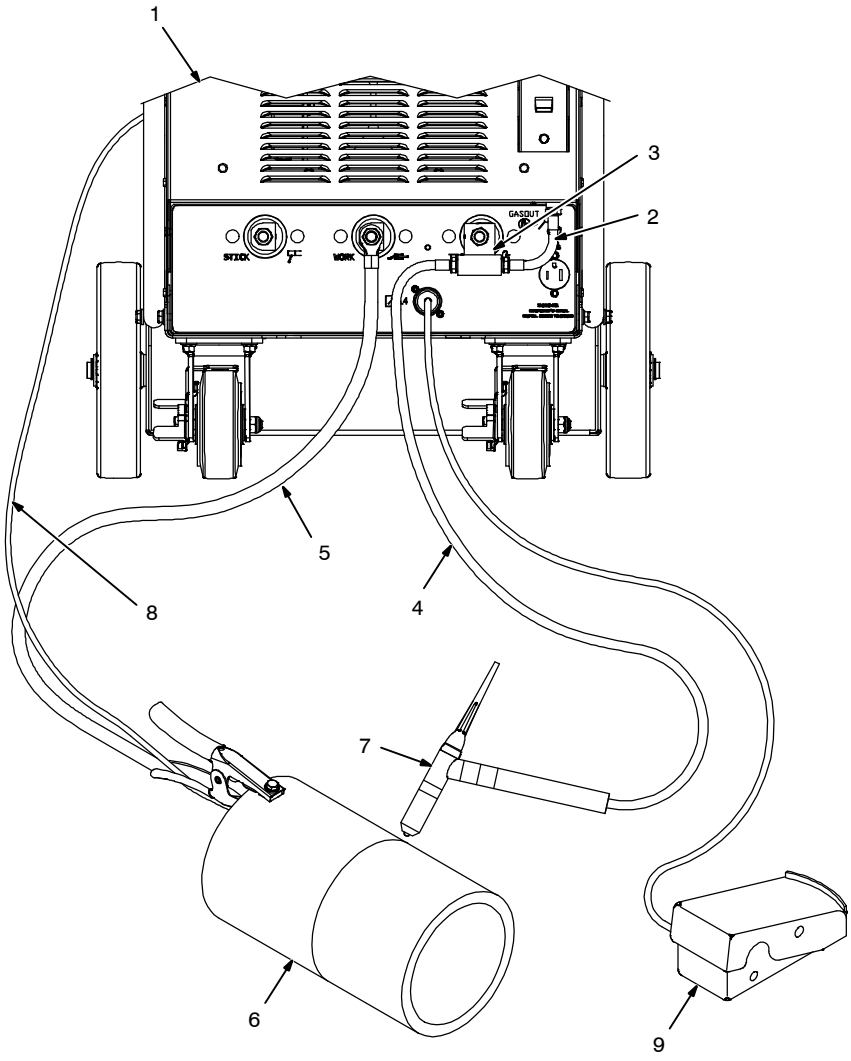
1 Welding Power Source
2 Gas Hose
3 TIG (–) Weld Cable
4 Work (+) Weld Cable
5 Workpiece
6 TIG Torch
7 Volt Sense Lead
8 Remote Foot Control (Optional)

☞ *Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.*

805 295-A

5-27. Typical Connection Diagram For One Piece Air-Cooled TIG (GTAW) Torch (Using Gas Solenoid Inside Power Source)



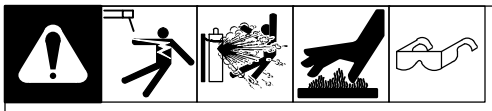


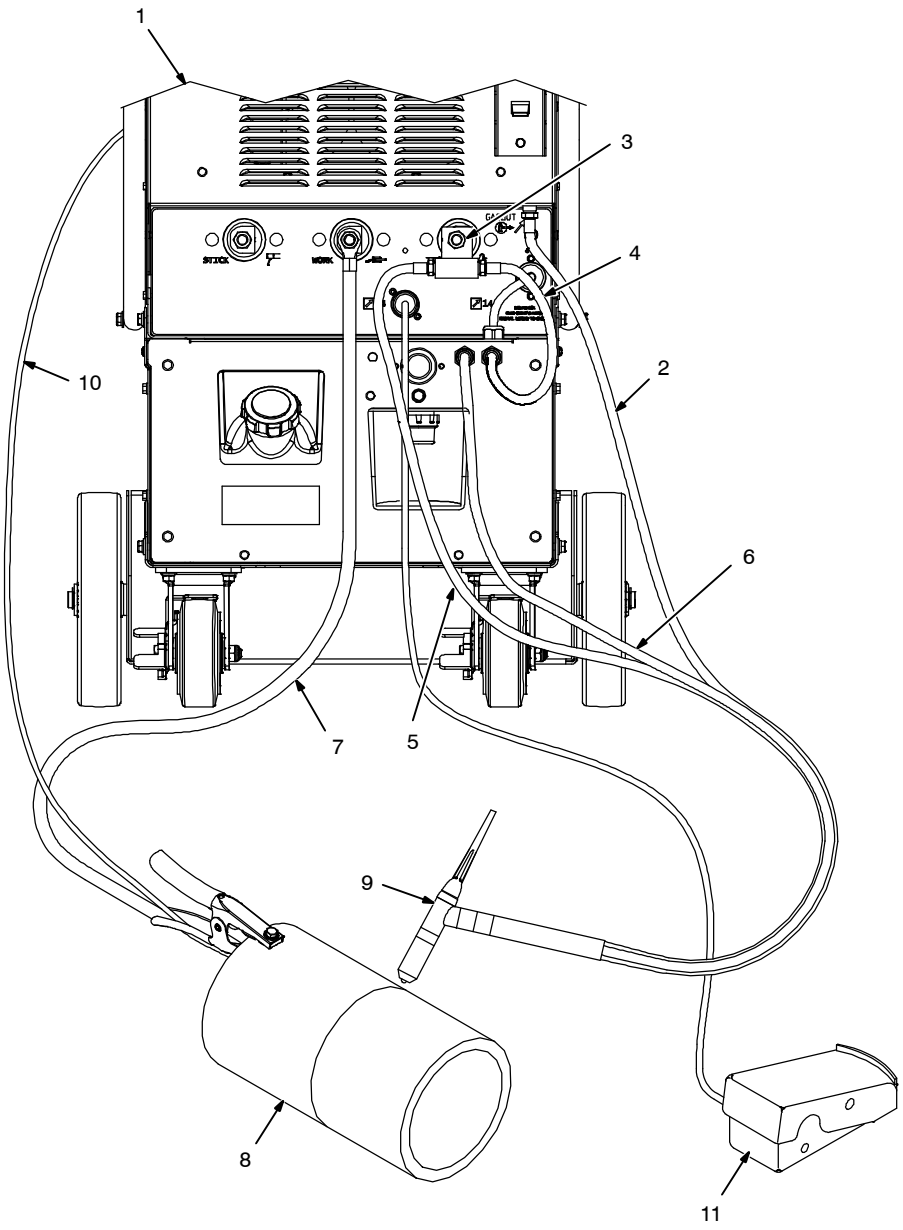
1 Welding Power Source
2 Gas Hose 237 415 (Short Black Hose Supplied With Power Source)
3 TIG Block (Customer Supplied)
4 TIG (–) Weld Cable
5 Work (+) Weld Cable
6 Workpiece
7 TIG Torch
8 Volt Sense Lead
9 Remote Foot Control (Optional)

☞ *Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.*

805 296-A

5-28. Typical Connection Diagram For Liquid-Cooled TIG (GTAW) Torch (Using Gas Solenoid Inside Power Source)





1 Welding Power Source
2 Gas Hose
3 TIG Block (Customer Supplied)
4 Coolant Out Hose 237 416 (Short Red Hose Supplied With Cooler)
5 TIG (–) Weld Cable
6 Coolant Return Hose
7 Work (+) Weld Cable
8 Workpiece
9 TIG Torch
10 Volt Sense Lead
11 Remote Foot Control (Optional)

☞ *Attach volt sense lead to work clamp and attach work clamp as close to arc as possible.*

254 084-A

SECTION 6 – OPERATION

6-1. Operational Terms

The following is a list of terms and their definitions as they apply to this interface unit:

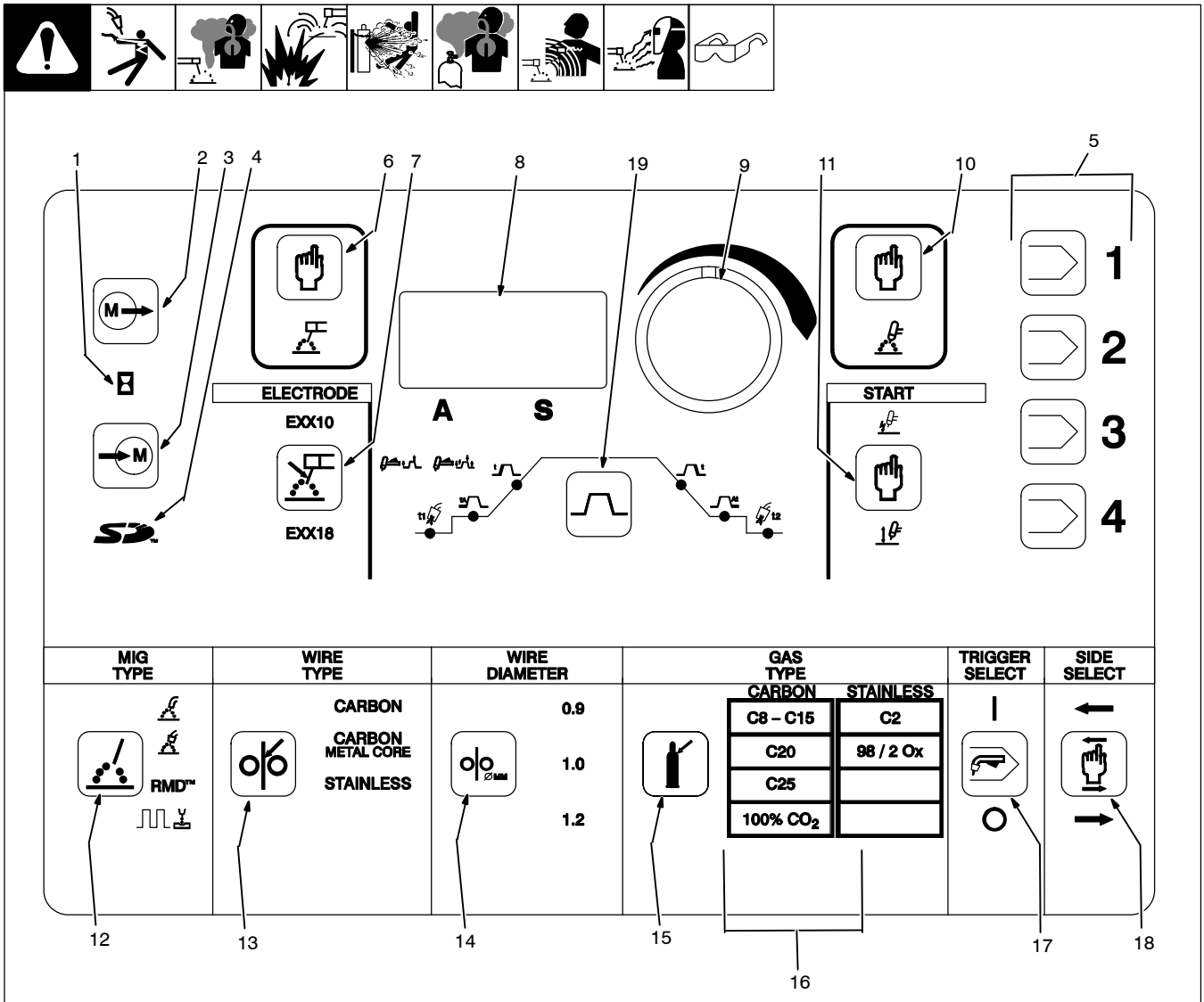
General Terms:

98/2 Ox	Gas mixture of 98% Argon and 2% O_2.
Amps	Indicates average amperage while welding and holds the value for 10 seconds at end of weld.
Arc Control	The adjustment of arc cone width and arc characteristics in the RMD and Pulse processes. Increasing Arc Control value increases the arc cone width and subsequently effects the arc length (end of electrode to workpiece). See Section 6-9 items 1 and 4 for adjusting Arc Control value.
Arc Length	Distance from end of wire electrode to workpiece. This term is also used to represent arc length adjustments in RMD and Pulse processes. Increasing Arc Length increases the actual arc length; likewise, decreasing Arc Length shortens actual arc length. See Section 6-9 items 2 and 3 for adjusting arc length value.
C2	Gas mixture of 98% Argon and 2% CO_2.
C20	Gas mixture of mainly Argon and 20% CO_2.
C20-C25	Gas mixture of mainly Argon and 25% CO_2.
C8-C15	Gas mixture of mainly Argon and 8-15% CO_2.
Dig	Adjustable setting for stick welding. Increasing the value provides additional amperage during low voltage (short arc length) conditions while welding. Helps avoid “sticking” the electrodes or snubbing out the arc when a short arc length is used.
Dual Schedule	A two position switch which attaches to (or incorporated in) the gun handle that can be used to change weld parameters during the MIG welding processes. The gun trigger operates as a standard trigger. Dual Schedule is always activated. See Section 6-2 item F 8 for setup procedure.
EXX10	Stick welding electrode type. EXXX1 or EXXX2 are typically used on this setting (cellulosic electrode).
EXX18	Stick welding electrode type. EXXX3 through EXXX8, or stainless are typically used on this setting (low hydrogen type electrode).
FCAW (Flux Cored Arc Welding)	Flux cored arc welding is a continuous electrode that is fed into the arc and depends on shielding gas from either an external source or is generated from the decomposition of gas forming ingredients contained in the electrode’s core. Only dual shielded wire is recommended for the PipeWorx 400. A gas mixture or wire diameter selection is not required. See wire manufacturer for the recommended gas mixture. The 0.9 to 1.6 mm wire sizes can be used in the process.
Gas Type	Selection of shielding gas being used in an application: C8-C15 (Argon/8-15% CO_2), C20 (Argon/20% CO_2), C25 (Argon/25% CO_2), 100% CO_2, C2 (Argon/2% CO_2), 98/2 Ox (Argon/2% O_2), CO_2 (100% CO_2).
HF	TIG starting method. High frequency turns on to help start the arc when output is enabled. High frequency turns off when arc is started and turns on whenever the arc is broken to help restart the arc. HF start is used for GTAW process when a non-contact arc start method is required.
Hot Start	Adjustable setting for stick welding. Allows for adjustment of the output amperage at the start of a stick weld, should the start require it. This helps eliminate sticking of the electrode at are start. Increasing the value increases the start amperage. Decreasing the value, decreases the start amperage.
Inductance Control	Allows setting inductance in MIG and FCAW. In short circuit GMAW welding, an increase in inductance will decrease the number of short circuit transfers per second (provided no other changes are made) and increase the arc-on time. The increased arc-on time makes the welding puddle more fluid. See Section 6-9 items 1 and 4 for adjusting Inductance Control value.
Jog	Method for feeding wire without contactor or gas valve being energized (see Section 6-9, item 9).
Lift-Arc	TIG starting method. Touch tungsten electrode to workpiece at weld start point and enable output and shielding gas with torch trigger, foot control, or hand control (if a control is desired). Hold electrode to workpiece for one to two seconds, and slowly lift electrode to form the arc. Lift-Arc is used for the GTAW process when HF Start method is not permitted.
MIG (GMAW)	Also referred to as solid wire welding. An arc welding process which joins metals by heating them with an arc. The arc is between a continuously fed filler metal (consumable) electrode and the workpiece. Externally supplied gas or gas mixtures provide shielding.
Postflow	The time that the shielding gas continues to flow after the arc has been terminated.
Preflow	The time that the shielding gas flows prior to arc initiation.
Process	A selection made for MIG, Pulse, RMD, Stick, Flux Core (FCAW), or TIG (Lift-Arc or HF starts).
Memory Location Buttons 1-4	By selecting a process such as STICK, TIG, MIG LEFT side of feeder, or MIG right side of feeder there will be four Memory Locations available for selection providing a total of 16 Memory Locations for a dual feeder. There will only be 12 Memory Locations available for a single feeder.

Pulse (Pro-Pulse™)	An advanced pulse spray transfer process suited for the fill and cap passes on pipe. The Pulse process utilizes constant current ramps with constant voltage control of peaks and backgrounds. Adaptive response is controlled by peak and minimum current levels. Benefits are shorter arc lengths, better puddle control, more tolerance of tip-to-work variation, less audible noise, no arc wandering, allows weld to fill in at toes increasing travel speed and deposition, and more tolerant to poor fit up and gaps. Settings for Pulse include Arc Length, Wire Speed and Arc Control.
Purge	Method for energizing the gas valve(s) to purge gas lines before welding and to preset gas pressure at the regulator (see Section 6-9, 11).
RMD	RMD stands for Regulated Metal Deposition, a precisely controlled short-circuit transfer process. Benefits of RMD are well suited to root pass welding on pipe, improves gap filling and spatter reduction. Provides less heat input into the workpiece, minimizes distortion and allows use of larger diameter wire on thin gauge materials. Settings for RMD include Arc Length, Wire Speed and Arc Control.
Stick (SMAW)	Stick (SMAW) welding uses a flux covered consumable electrode that produces a shielding gas and slag to shield the arc and molten weld puddle.
Synergic	Synergic refers to the unit's ability to use preprogrammed parameters to determine the actual pulse settings of Peak Amperage, Background Amperage, Pulse Frequency, and Pulse Width at any specific wire feed speed setting. This is a characteristic used in RMD and Pulse processes.
TIG (GTAW)	TIG (GTAW) welding uses a non-consumable tungsten electrode and shielding gas to produce a strong, clean, high quality weld.
Trigger Hold	This feature reduces welder fatigue by allowing continuous welding without holding the trigger. See Section 6-9 item 10 to set up the Trigger Hold feature.
Trigger Select	This feature allows the operator to select MIG processes in Memory Locations 1-4 by pressing the gun trigger. See Section 6-2 item F 6 to set up the Trigger Select feature.
Trim	See Arc Length description.
Volts	Preset voltage in MIG mode at idle, actual voltage while welding, and 10 seconds hold value at end of weld.
Wire Diameter	Selection of wire diameter for MIG RMD and Pulse processes. The 0.9, 1.0 or 1.2 wire size must be selected for MIG RMD and Pulse processes. The 0.9 to 1.6 wire sizes can be used with FCAW, but a wire selection is not required.
Wire Type	Selection of wire type (carbon, metal core or stainless).
WFS	Term used to represent wire feed speed. In MIG mode, wire feed setting is independent of voltage setting. In Pulse and RMD, adjusting wire feed speed also increases power level on wire electrode (one knob control).

6-2. Welding Power Source Controls

A. Front Panel Controls



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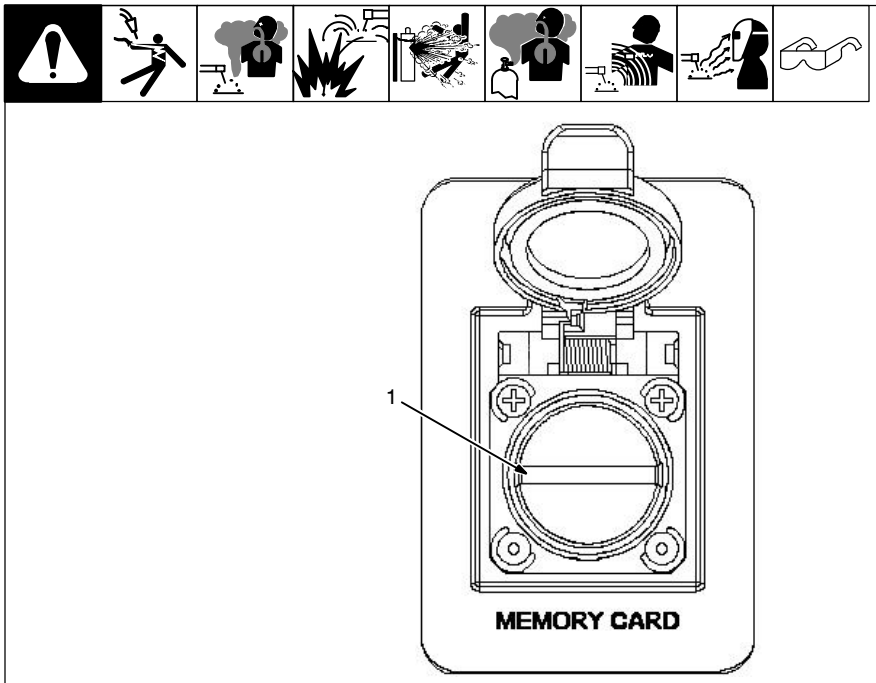
☞ ***Only illuminated controls can be changed or adjusted.***

1 Memory Card Busy Indicator
2 Memory Card Save Button
3 Memory Card Load Button
4 Memory Card Indicator
5 Memory Location Buttons 1-4
6 Stick Process Select Button
7 Stick Electrode Type Select Button
8 Ammeter Display
9 Amperage Adjust Knob
10 TIG Process Select Button
11 TIG Starting Method Select Button
12 MIG Process Type Select Button
13 Wire Type Select Button
14 Wire Diameter Select Button
15 Gas Type Select Button
16 Gas Selection Table
17 Trigger Select Button
18 Side Select Button
19 TIG Sequence Controls

6-3. Memory Card Slot



1 Memory Card Slot

This is the memory card slot. The memory card slot uses an SD memory card. A memory card can be inserted into the slot and used for storing and retrieving operator settings, providing custom MIG type weld process data, and loading firmware updates to the unit. If the power source has multiple users, each user may use a card to store and load their own personal settings. Push in and release the card edge to eject it from the slot.

A. Memory Function Controls

1. Memory Card Busy Indicator

The memory card busy LED illuminates during the following conditions: storage/retrieval of operator settings, usage of custom MIG type weld process, and firmware upgrades.

2. Memory Card Save Button

Press and release this button to save all stored operator settings in memory locations 1-4 as a setup configuration file to memory card. The Busy LED will illuminate to indicate the save operation is in progress. In addition, whenever the Save button is pressed a file named PIPEWORX.TXT is updated on the Memory Card. This file has a PipeWorx Status Summary, Firmware Revisions, and Fault History. The file can be read using a computer equipped with a memory card reader. This information can be used for maintenance schedules or troubleshooting.

3. Memory Card Load Button

Press and release this button to load a previously saved configuration file from the memory card in the card slot. This operation allows restoring previously saved operator settings on the card to memory locations 1-4. The busy LED will illuminate to indicate the load operation is in progress.

4. Memory CARD Indicator

The memory CARD text will illuminate when custom MIG or TIG type weld process data is currently being used from the memory card.

B. Using Optional Memory Card

1. Memory Card Insertion

    a. Lift and hold memory card access cover open.

    b. Insert memory card into slot (push card all the way into slot and then release).

    c. Close memory card access cover.

2. Memory Card Removal

    a. Lift and hold memory card access cover open.

    b. Push in and release memory card to eject card.

    c. Grasp memory card and remove from slot.

    d. Close memory card access cover.

3. Optional Program Card Operation

    a. Insert optional program card into slot.

    b. Select wire feeder as follows:
    Press either the LEFT or RIGHT (dual feeder only) button on the feeder.
    or
    Press the SIDE SELECT button on the power source until the desired wire feeder side is illuminated.

    c. Select weld process by pressing the MIG TYPE button on the power source front panel until the desired process is illuminated. CARD will illuminate on the power source front panel as well as on the feeder front panel to indicate that the optional program is being used from the memory card.

    d. Select the wire diameter, if applicable, as follows:
    Press the WIRE DIA button on the power source front panel until the desired wire diameter is illuminated.

☞ *Some optional program cards only support a single wire diameter, in this case, only that diameter will illuminate.*

    e. Remove memory card to revert to standard operation.

4. Optional Feature Card Operation

    a. Insert optional feature card.

    b. Specific feature will be displayed on Volt meter of feeder.

    c. Turn WFS knob to enable/disable feature.

    d. Remove card.

☞ *One card can enable/disable multiple machines.*

5. Software Update Card (System Software Update)

    a. Insert software update card into slot.

    b. Perform software update by pressing and holding the LOAD button on the power source front panel until UPd appears on the 7-segment LED display.

    c. Wait for the software update to complete (approximately two minutes).

☞ *During the software update, the displays on both the power source and feeder front panels may display H99 or H98 as well as the UPd or go blank for a period of time. This is normal during a software update. Do not remove the memory card until the software update has completed. Do not turn off the power source until the software update has completed.*

    d. Remove memory card.

C. Memory Locations

1. Memory Location Buttons 1-4

These are locations for storing weld process settings for easy access. Press and release these buttons to recall stored unit configuration settings. Only one memory location can be active during unit operation. The number next to the button illuminates to indicate the active memory location. Unit configuration settings are automatically saved to the active memory location one second after any change is made to any of the front panel controls. This feature allows the unit to remember an operator's preferred settings. These settings can be recalled at any time by selecting the appropriate memory location and process/feeder side. By selecting a process such as STICK, TIG, MIG LEFT side of feeder, or MIG RIGHT side of feeder there will be four Memory Locations available for each, providing a total of 16 Memory Locations for a dual feeder. There will only be 12 Memory Locations available for a single feeder.

2. Memory Location Reset

Pressing and holding a memory location button for more than two seconds will restore factory default settings for the current weld process to that particular memory location. The memory location number light will go out and back on when the reset is complete.

D. Stick And TIG Welding Process Controls

1. Stick Process Select Button

Press and release this button to activate the stick welding process controls. The STICK text below the button illuminates as well as the active stick electrode type text and the swoosh above the amperage adjust knob. The operator must select the desired stick electrode type and adjust the amperage knob to the appropriate setting within a range from 40 to 400 amps.

2. Stick Electrode Type Select Button

Press and release this button to select the desired stick electrode type (EXX10 or EXX18). The text above or below the button will illuminate for the active electrode type. This button is only active with the stick welding process selection and only then will text for the electrode type selection illuminate.

3. Adjustable DIG And Hot Start

Adjustable DIG and Hot Start features are provided when in the STICK process. Settings for both DIG and Hot Start on EXX10 and EXX18 electrodes are independent (each has their own settings). To access the adjustable DIG and adjustable Hot Start functions, proceed as follows:

a. When in the STICK mode, press and hold the STICK button for two seconds.
The Amperage display will show the DIG setting with the right most decimal point illuminated.
The default value for DIG is 40.

b. Rotate the Amperage knob to adjust the DIG setting.
Adjustable range is 0 to 99.

c. When in the adjustable DIG function, press the STICK button To access the adjustable Hot Start function.
The Amperage display will show the Hot Start setting with the middle decimal point illuminated.
The default setting is 1.3.

d. Rotate the Amperage knob to adjust the Hot Start setting. Adjustable range is 0.0 to 2.0.

e. Press the STICK button or any other button on the interface to exit the adjustable DIG and Hot Start function.

4. Ammeter Display

The display illuminates and shows amperage setting when either a stick or TIG welding process is selected. Dashes are displayed when any MIG welding process is selected indicating the display is inactive; however, actual amperage is displayed while welding regardless of the selected welding process. Measured amperage just prior to the end of a welding operation will appear on the display for 10 seconds after the welding operation.

5. Amperage Adjust Knob

Use this knob to set a desired amperage setting for either a stick or TIG welding process. Rotating the knob clockwise increases amperage and counter-clockwise decreases amperage. Amperage adjustment is active when the swoosh above the knob is illuminated. If a remote control is connected to the Remote 14 receptacle, the unit will automatically adjust output control to a primary/secondary configuration. In this configuration, the Amperage Adjust knob on the unit becomes the primary and sets the maximum amperage output of the unit. The remote control becomes the secondary and provides an amperage range of 0 to 100% based on the Amperage Adjust knob setting.

☞ *The Remote 14 receptacle is factory set to be active in TIG mode only. As an option, this receptacle may also be enabled in Stick mode (see Section 5-4).*

6. TIG Process Select Button

Press and release this button to activate the TIG welding process controls. The TIG text below the button illuminates as well as the active starting method text and the swoosh above the amperage adjust knob. The operator must select the desired starting method and adjust the amperage knob to the appropriate setting within a range from 10 to 350 amps. If the TIG process has been selected and a remote current/contactor control is connected, holding the TIG process select button for more than two seconds will display the effective amperage command (based on the amperage setting and the remote current/contactor control setting).

7. TIG Starting Method Select Button

Press and release this button to select the desired TIG starting method either HF or Lift Arc. The text above or below the button will illuminate for the active starting method. This button is only active with the TIG welding process selection and only then will text for the starting method selection illuminate.

E. TIG Sequence Controls

The TIG Sequence Controls provides flexibility in the TIG process operation. It provides “Std” (no sequencing), 2T and 4T trigger operation. The TIG Sequence Controls are active for both Lift Arc and HF start mode, To activate TIG Sequencing, proceed ad follows:

a. Press the TIG Set-up button.
When pressed, the Amperage display will show “Std”, “2T” or “4T”.
Rotate the Amperage knob to select the desired operation mode. When “2T” or “4T” is selected, the appropriate icon on the interface panel will illuminate.

b. Sequential pressing of the TIG Set-up button will cycle through the set-up options. An LED will illuminate at each option indicating the active option being programmed.

- Preflow – 0.0 to 10.0 seconds (HF start only)
- Initial amperage – 10 to 350 amps
- Initial time – 0.0 to 10.0 seconds (2T only)
- Ramp up time – 0.0 to 10.0 seconds

- Ramp down time – 0.0 to 10.0 seconds
- Final amperage – 10 to 350 amps
- Final time – 0.0 to 10.0 seconds (2T only)
- Postflow time – 0 to 60 seconds

2T Trigger Operation

When in the 2T trigger mode the following weld sequence will occur:

- Press and hold the TIG torch trigger to start the sequence.
- Preflow is conducted for the programmed time.
- After preflow, the weld sequence starts in accordance to the programmed parameters (initial amperage and time, ram-up time).
- After reaching the weld current, the weld will continue as long as the TIG torch trigger is depressed.
- Release the trigger to initiate the stop sequence. The stop sequence will proceed in accordance with the programmed parameters (ramp down time, final amperage and time, postflow).

4T Trigger Operation

When in the 4T trigger mode the following weld sequence will occur:

- Press and hold the TIG torch trigger to start the sequence.
- Preflow is conducted for the programmed time.
- After preflow, initial amperage is started if programmed. The initial amperage will be maintained as long as the TIG tor trigger is depressed.
- Releasing the TIG torch trigger initiates the ramp-up time until the welding amperage is reached.
- Welding will continue at the welding amperage setting.
- Press and hold the TIG torch trigger to initiate the ramp down time and final amperage. The final amperage will be maintained as long as the TIG torch trigger is depressed.
- Release the TIG torch trigger to stop the welding process. When released, postflow is initiated in accordance with the programmed value.

F. MIG Welding Process Controls

☞ *The reference to left side feeder controls or left side gun trigger applies to either a single feeder or dual feeder. The reference to right side feeder controls or right side gun trigger only applies to a dual feeder.*

The controls in the MIG setup panel are only active when in the MIG process. **Press and release the SIDE SELECT button to activate the MIG process and the desired feeder side.** The LEFT or RIGHT text will illuminate to indicate the the active feeder side (only LEFT will illuminate when using a single feeder). The MIG welding process controls can also be activated at the feeder front panel by pressing LEFT or RIGHT, or by pressing the left or right side gun trigger (see Section 6-9A). The MIG setup panel controls on the welding power source should be selected in order from left to right starting with MIG type and ending with trigger select.

1. MIG TYPE Process Select Button

Press and release the MIG TYPE button to select the desired process (FCAW, MIG, RMD, or PULSE). The text illuminates to the right of this button to indicate the active process selection:

FCAW – gas shielded flux cored welding process

MIG (GMAW)– standard short circuit or spray welding process

RMD™ (Regulated Metal Deposition) – modified short circuit welding process

PULSE (GMAW-P) – Pro-Pulse™ pulse welding process.

2. WIRE TYPE Select Button

Press and release WIRE TYPE button to select the desired wire type (CARBON, CARBON METAL CORE or STAINLESS steel). The text illuminates above or below the button to indicate the active wire type selection. This selection is required for all MIG process types except FCAW.

3. WIRE DIAMETER Select Button

Press and release the WIRE DIA button to select the desired wire diameter (0.9, 1.0 or 1.2). The text illuminates above or below the button to indicate the active wire diameter selection. This selection is required for all MIG process types except FCAW.

4. GAS TYPE Select Button

Press and release GAS TYPE button to select the desired shielding gas. This button will cycle through and illuminate only the available gas selections in one particular column of the gas table based on the selected MIG process and WIRE TYPE type. The text illuminates when any MIG process is selected except FCAW.

5. Gas Selection Table

The gas selection table provides the available shielding gas selections. For any MIG process except FCAW, gas selections are structured into columns based first on WIRE TYPE type and then on MIG process selections. The gas type text illuminates to indicate the active gas selection. Shielding gas selections are as follows:

C8-C15 (92% Argon/8% CO_2 to 85% Argon/15% CO_2)
C20 (80% Argon/20% CO_2)
C25 (75% Argon/25% CO_2)
CO_2 (100% CO_2)
C2 (98% Argon/2% CO_2)
98/2 Ox (98% Argon/2% O_2)

6. TRIGGER SELECT Button

Press and release TRIGGER SELECT button to enable/disable the trigger select feature for memory locations 1-4. The indicator above or below the button, either On or Off respectively, illuminates to indicate the current trigger select status. This feature must have at least two memory locations enabled to perform its function, but as many as four memory locations can be enabled for TRIGGER SELECT. The desired MIG process type(s) and parameter settings should first be loaded to each memory location prior to welding. These parameter settings (voltage/arc length and wire feed speed) are made at the wire feeder front panel (see Section 6-9). Once parameters are set, quickly press and release gun trigger, in less than 0.2 seconds while not welding, to select the next enabled memory location. If the gun trigger is pressed and held for 0.2 seconds or longer, the memory location will not advance and parameter settings will remain at the current settings.

7. SIDE SELECT Button

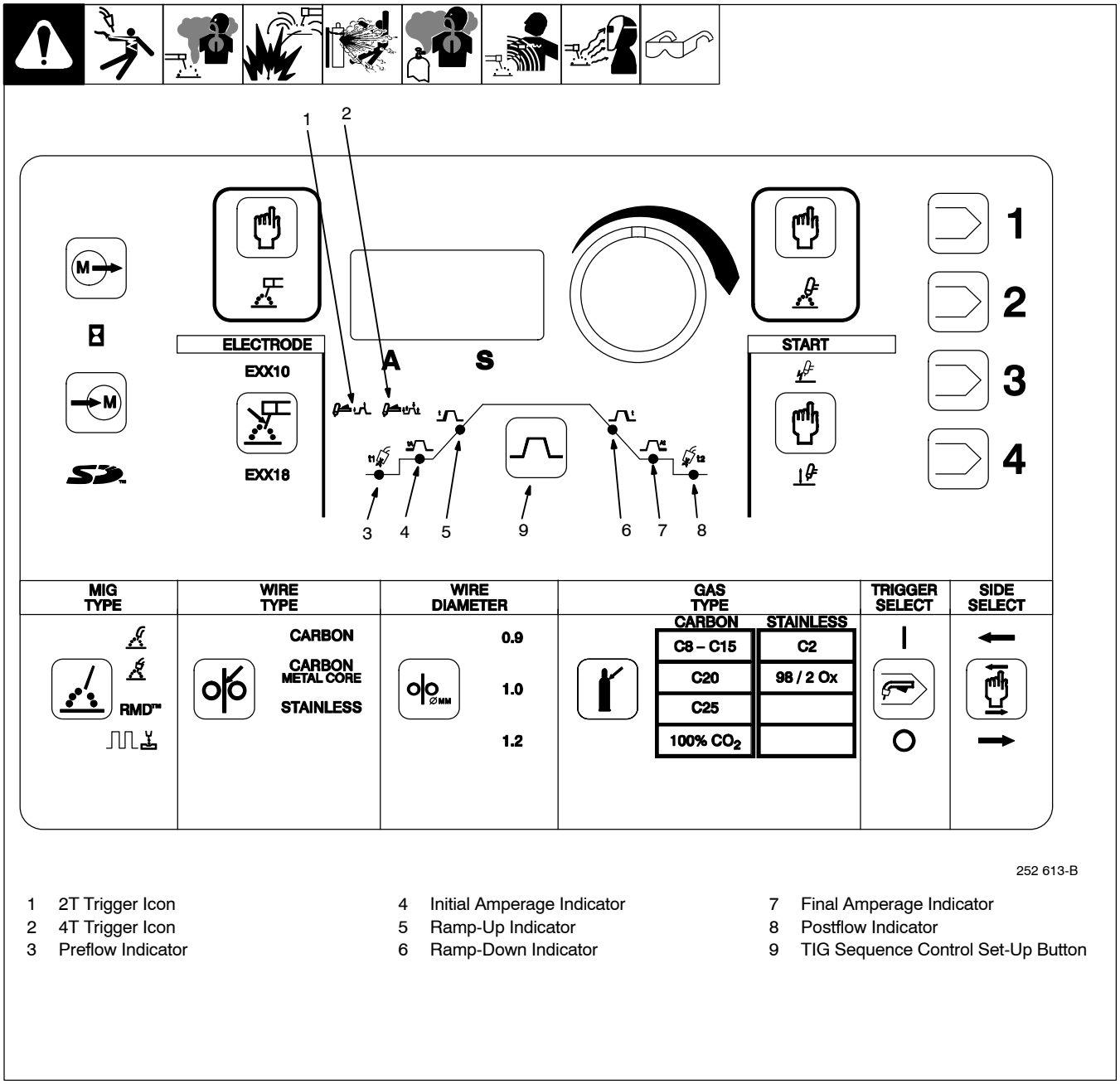
Press and release SIDE SELECT button to select the MIG process and the desired side of a dual feeder (only LEFT will illuminate when using a single feeder).

8. Dual Schedule

To use Dual Schedule, plug in the switch, and select the MIG TYPE Process with the necessary selections and parameters with the switch in one position. Then move the switch position and select the MIG TYPE Process with the necessary selections and parameters again. Essentially, there are two programs saved to the selected memory location.

Notes

6-4. TIG Sequence Control



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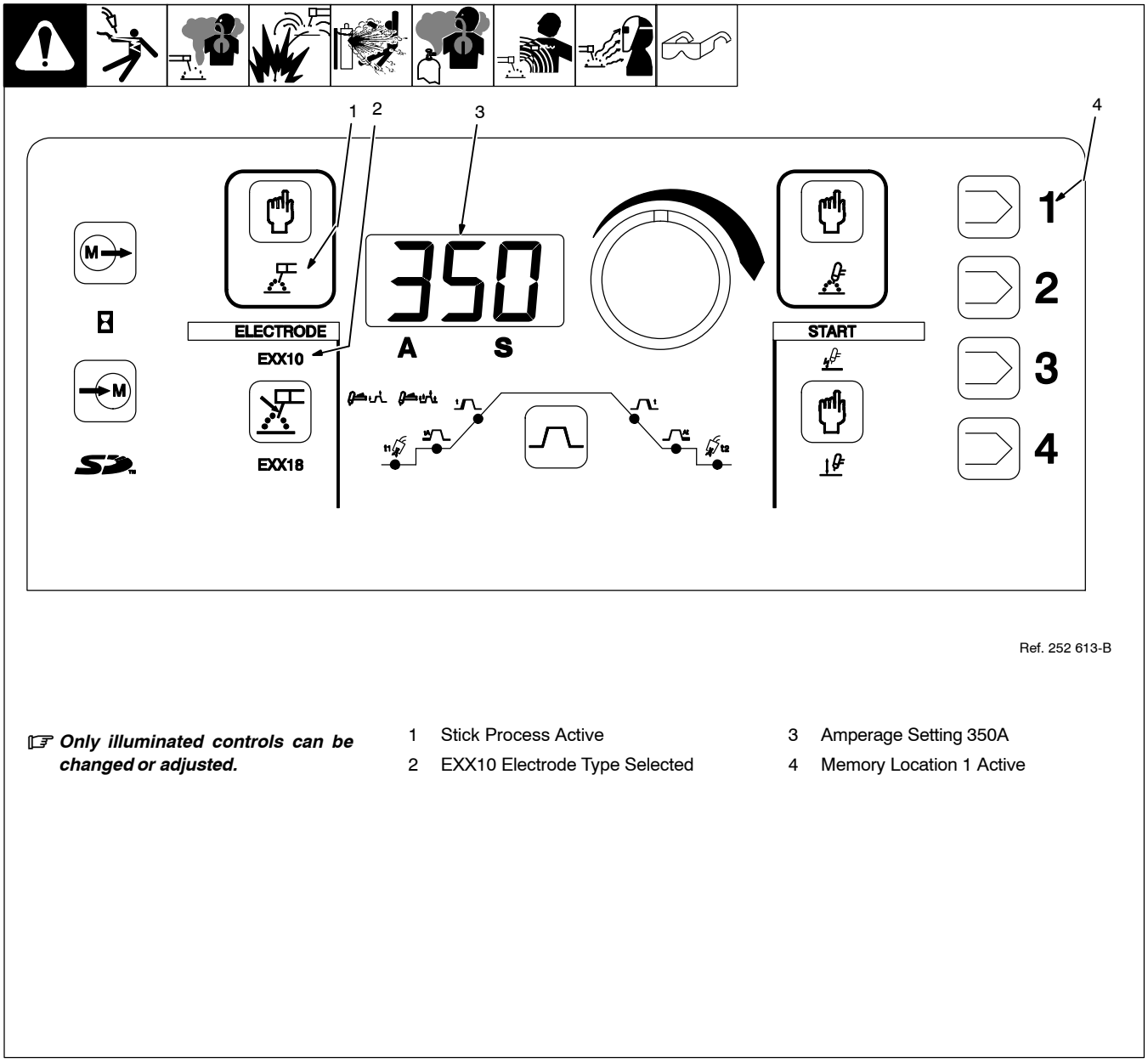
1 2T Trigger Icon
2 4T Trigger Icon
3 Preflow Indicator
4 Initial Amperage Indicator
5 Ramp-Up Indicator
6 Ramp-Down Indicator
7 Final Amperage Indicator
8 Postflow Indicator
9 TIG Sequence Control Set-Up Button

6-5. Stick Process Selection Setup Example

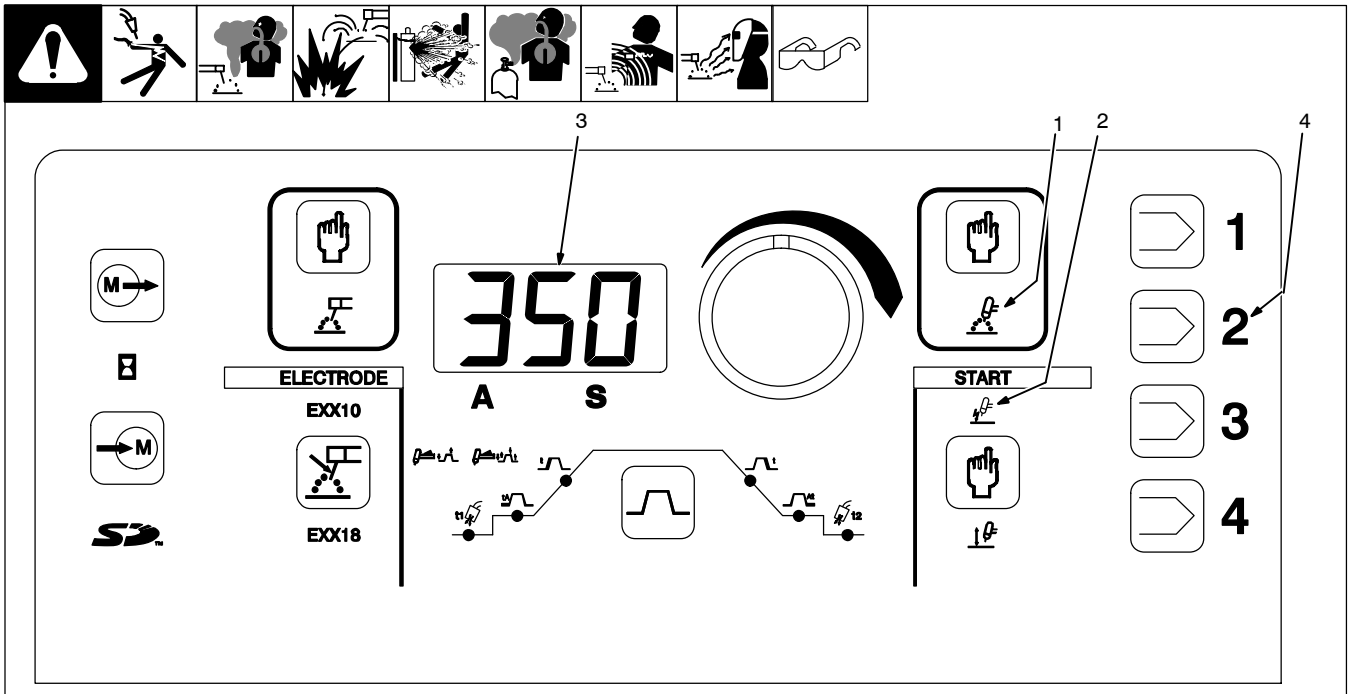


Ref. 252 613-B

☞ ***Only illuminated controls can be changed or adjusted.***

1 Stick Process Active
2 EXX10 Electrode Type Selected
3 Amperage Setting 350A
4 Memory Location 1 Active

6-6. TIG Process Selection Setup Example

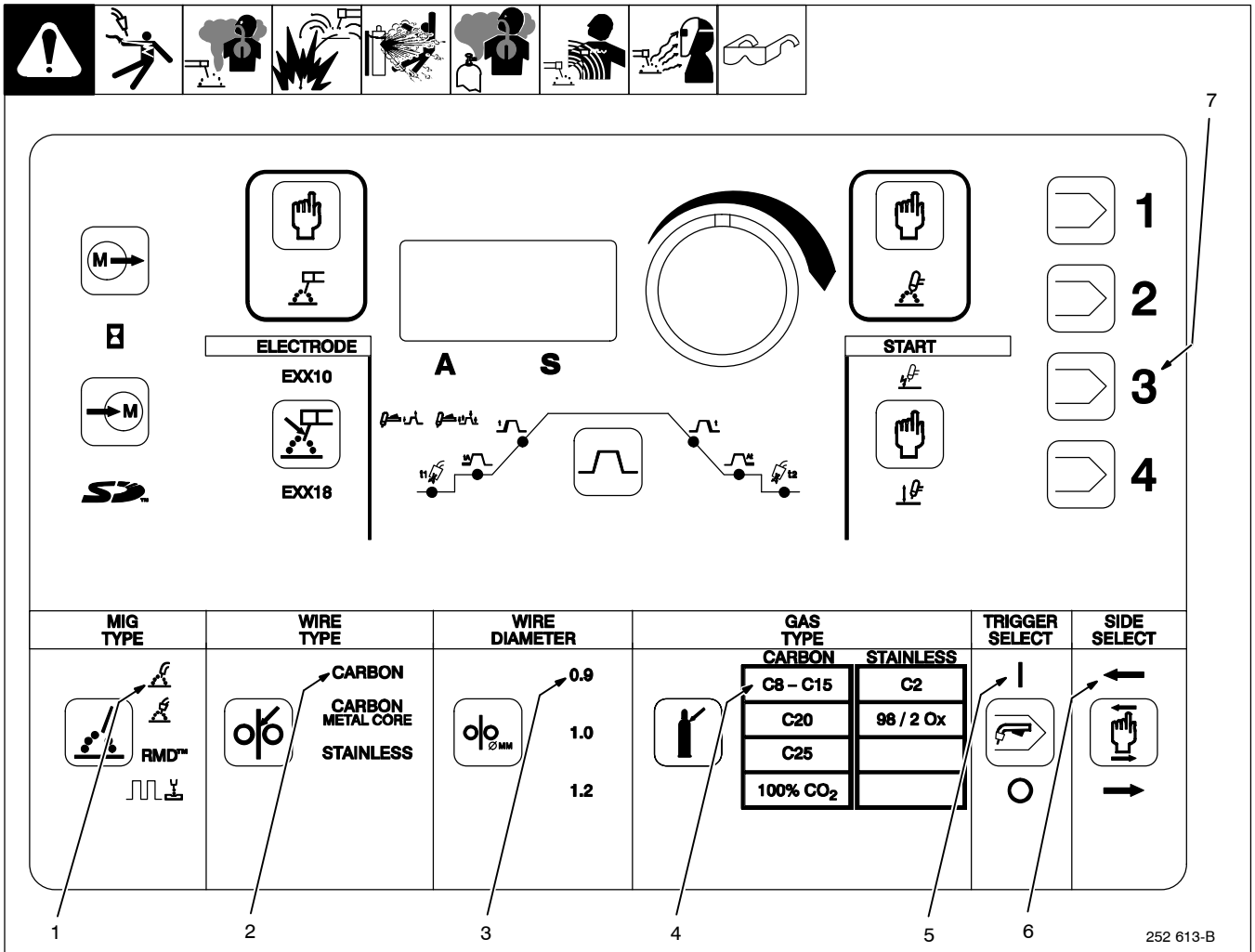


Ref. 252 613-B

☞ ***Only illuminated controls can be changed or adjusted.***

1 TIG Process Active
2 HF Start Method Selected
3 Amperage Setting 350A
4 Memory Location 2 Active

6-7. MIG Process Selection Setup Example 1



☞ ***Only illuminated controls can be changed or adjusted.***

1 MIG Process Active

2 Carbon Steel Wire Type Selected

3 0.9 Wire Diameter Selected

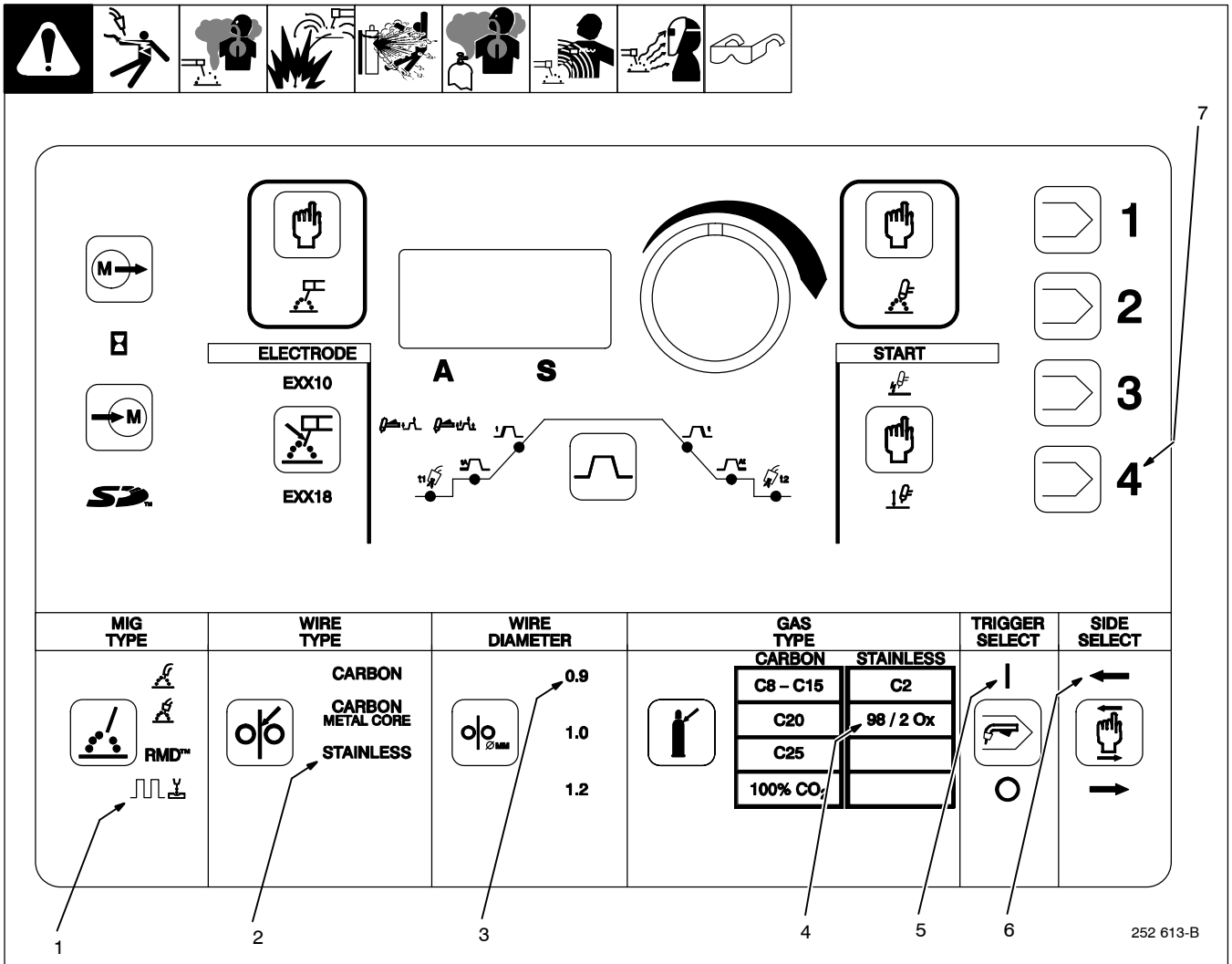
4 C8-C15 Gas Type Selected

5 Trigger Select On

6 Side Select Left

7 Memory Location 3 Active

6-8. MIG Process Selection Setup Example 2



☞ ***Only illuminated controls can be changed or adjusted.***

1 Pro-Pulse MIG Process Active

2 Stainless Steel Wire Type Selected

3 0.9 Wire Diameter Selected

4 98/2 Ox Gas Type Selected

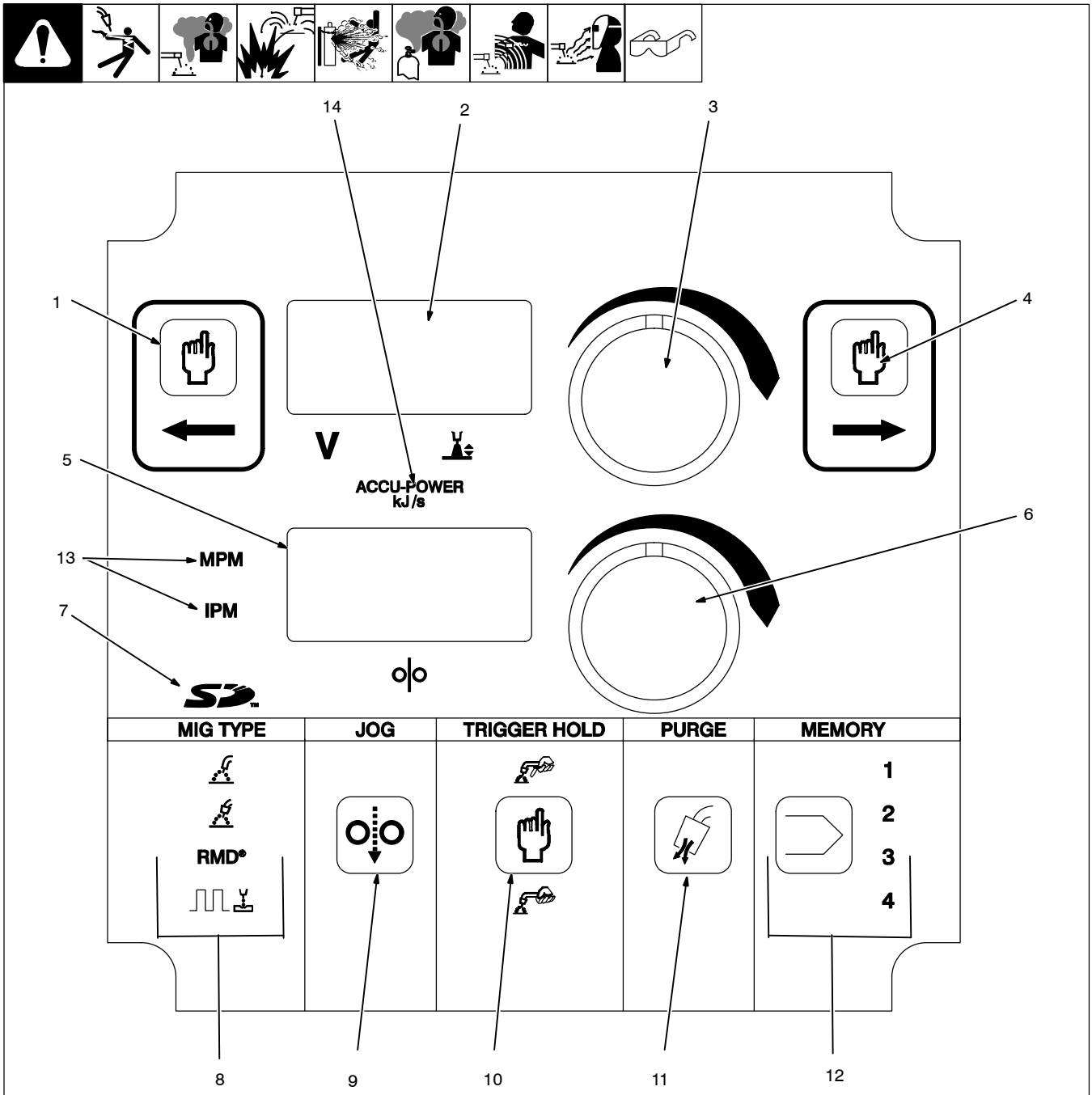
5 Trigger Select On

6 Side Select Left

7 Memory Location 4 Active

6-9. Wire Feeder Controls

A. Front Panel Controls



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☞ ***Only illuminated controls can be changed or adjusted.***

1 Left Side Controls Select Button
2 Volts/Arc Length Display
3 Volts/Arc Length Adjust Knob
4 Right Side Controls Select Button*
5 Wire Feed Speed Display
6 Wire Feed Speed Adjust Knob
7 Memory Card Indicator
8 MIG Process Type Indicator
9 Jog Button
10 Trigger Hold Select Button
11 Purge Button
12 Memory Select Button And Location Indicator
13 Wire Feed Speed Units Indicators
14 Accu-Power Indicator

*Dual Feeder Only

1. Left Side Controls Select Button

Press and release this button to activate the wire feeder left side controls. The LEFT text below the button will illuminate and the swooshes above the volts/arc length adjustment knob and wire feed speed adjustment knob will illuminate. See Section 6-2 for the procedure to select the appropriate MIG process type parameters. Pressing the left side welding gun trigger will also active the left side controls.

When in Pulse or RMD, holding the Left Side Select button for more than two seconds will activate Arc Control. “ARC” will be shown on the lower display and the Arc Control value on the upper display. The setable range is –25 to +25 with 0 as nominal. Increasing Arc Control value increases the arc cone width and subsequently effects the arc length (end of electrode to workpiece distance). Decreasing Arc Control value decreases the arc cone width and subsequently effects the arc length (electrode to workpiece distance).

When in MIG or FCAW, holding the Left Side Select button for more than two seconds will activate Inductance Control. “IND” will be shown on the lower display and the Inductance Control value on the upper display. The setable range is 0 to 99 with nominal setting being program specific. An increase in inductance will decrease the number of short circuit transfers per second (provided no other changes are made) and increase the arc-on time. The increased arc-on time makes the welding puddle more fluid. A decrease in inductance will increase the number of short circuit transfers per second (provided no other changes are made) and decrease the arc-on time. The decreased arc-on time makes the welding puddle less fluid.

2. Volts/Arc Length Display

This display shows the voltage setting for MIG and FCAW processes (10.0 to 44.0 volts), and it shows the arc length for RMD and Pro-Pulse processes (–3.0 to +3.0 in 0.1 increments with 0 as nominal). The actual arc voltage is displayed while welding and continues to appear for 10 seconds after the welding arc is extinguished. Dashes appear on the display when other welding processes are selected.

3. Volts/Arc Length Adjust Knob

Use this knob to adjust the desired voltage setting (10.0 to 44.0 volts) or arc length setting (–3.0 to +3.0 in 0.1 increments with 0 as nominal) depending on the type of MIG process selection. Rotating the knob clockwise increases volts/arc length and counter-clockwise decreases volts/arc length. Volts/arc length adjustment is active when the swoosh above the knob is illuminated. The setting can be different for left and right sides, and the unit will hold these settings for both sides.

4. Right Side Controls Select Button (Dual Feeder Only)

Press and release this button to activate the wire feeder right side controls. The RIGHT text below the button will illuminate and the swooshes above the volts/arc length adjustment knob and wire feed speed adjustment knob will illuminate. See Section 6-2 for the procedure to select the appropriate MIG process type parameters. Pressing the right side welding gun trigger will also active the right side controls.

When in Pulse or RMD, holding the Right Side Select button for more than two seconds will activate Arc Control. “ARC” will be shown on the lower display and the Arc Control value on the upper display. The setable range is –25 to +25 with 0 as nominal. Increasing Arc Control value increases the arc cone width and subsequently effects the arc length (end of electrode to workpiece distance). Decreasing Arc Control value decreases the arc cone width and subsequently effects the arc length (end of electrode to workpiece distance).

When in MIG or FCAW, holding the Right Side Select button for more than two seconds will activate Inductance Control. “IND” will be shown on the lower display and the Inductance Control value on the upper display. The setable range is 0 to 99 with nominal setting being program specific. An increase in inductance will decrease the number of short circuit transfers per second (provided no other changes are made) and increase the arc-on time. The increased arc-on time makes the welding puddle more fluid. A decrease in inductance will increase the number of short circuit transfers per second (provided no other changes are made) and decrease the arc-on time. The decreased arc-on time makes the welding puddle less fluid.

5. Wire Feed Speed Display

This display shows the wire feed speed setting when any of the MIG process types are selected and the display is blank when other processes are selected. The wire feed speed range that can be displayed is from 1.3 to 19.8 mpm (50 to 780 ipm). Also, when the jog button is pressed the current jog speed appears on the display.

6. Wire Feed Speed Adjust Knob

Use this knob to adjust the desired wire feed speed setting [1.3 to 19.8 mpm (50 to 780 ipm)]. Rotating the knob clockwise increases wire feed speed and counter-clockwise decreases wire feed speed. Wire feed speed adjustment is active when the swoosh above the knob is illuminated. The setting can be different for left and right sides and MIG process type, and the unit will hold these settings for both sides.

7. Memory Card Indicator

The CARD text will illuminate to indicate that custom MIG type weld process data is currently being used from the memory card.

8. MIG Process Type Indicator

The FCAW, MIG, RMD, or PULSE text illuminates to indicate which type of MIG process is selected at the welding power source (see Section 6-2). No text illuminates when other welding processes are selected.

9. Jog Button

Press and hold this button to jog wire on either the left or right side depending on the active side selection. Rotate the wire feed speed adjustment knob to change jog speed. Rotating the knob clockwise increases jog speed and counter-clockwise decreases jog speed. Release the button to stop the jog operation and the display will return to the initial wire feed speed setting.

Wire jog is also initiated by pressing and holding the MIG gun trigger without establishing an arc. If the gun trigger is depressed and an arc is not established, the feeder will automatically go into jog after 2 seconds.

Auto Jog

- Pressing and releasing the jog and trigger hold buttons simultaneously will activate the auto jog function. Depending on the active side selection, the left or right (dual feeder only) side will automatically jog a preset amount of wire. The volts/arc length display will count down in 0.01 m or 0.1 ft decrements starting at the preset wire length. A default preset wire length is set at 4.7 m (15.3 ft), but the length can be changed within a range of 1.5 to 9.1 m (5.0 to 30.0 ft) using the volts/arc length adjust knob. Rotating the knob clockwise increases wire length and counter-clockwise decreases wire length. The volts/arc length display will show the set wire length for a short time after making any desired adjustment. If no further changes are made to the wire length after one second the unit will resume the count down display. Jog speed can also be adjusted within a range of 1.3 to 19.8 m (50 to 780 ipm) using the wire feed speed adjust knob and the wire feed speed display will show the current jog speed setting.

10. Trigger Hold Select Button

Press and release this button to enable/disable the trigger hold feature. The text above or below the button, either ON or OFF respectively, illuminates to indicate the current trigger hold selection. When trigger hold is active, the gun trigger must be pressed and held for a minimum of one half second, but not more than six seconds. Then releasing the gun trigger activates the trigger hold function. To stop welding, press and release the gun trigger.

11. Purge Button

Press and hold this button to purge shielding gas lines prior to welding and to preset gas pressure at the regulator for either the left or right (dual feeder only) side. This button will also purge the TIG gas solenoid located at the welding power source if the TIG welding process is selected. Release the button to stop the purge operation.

Timed Purge

- Pressing and releasing the purge and trigger hold buttons simultaneously will activate the timed purge function. The volts/arc length display will count down in 1 second decrements starting at the preset amount of time. A default preset time period is set at 30 seconds, but the time can be changed within a range of 5 to 60 seconds using the volts/arc length adjust knob. Rotating the knob clockwise increases time and counter-clockwise decreases time. The volts/arc length display will show the set time after making any desired adjustment. If no further changes are made to the time period after one second the unit will resume the count down display.

12. Memory Select Button And Location Indicator

Press and release this button to scroll through stored unit configuration in locations 1-4. This button can only recall configurations and cannot be used to restore factory default settings to a memory location (see Section 6-2).The numeral next to the button illuminates to indicate the active memory location.

13. Wire Feed Speed Units Indicators

Indicators display the settings for Wire Feed Speed; inches per minute (IPM) or meters per minute (mpm).

14. Accu-Power Indicator

Indicator illuminates when Accu-Power is enabled on the welding system. Accu-Power displays instantaneous power during welding to meet the new ASME requirement for calculating heat input on complex waveform processes (“RMD” and Pro-Pulse™). Requires version 1.07 software minimum. See product literature sheet.

6-10. Preflow And Postflow Adjustment

☞ *Postflow will not function without an arc initiation.*

Preflow and Postflow times can be configured for each of the TIG, Wire Feeder Left and Wire Feeder Right outputs. These times are global settings (i.e. all memory slots share the same three preflow and postflow settings; it is not possible to set different postflow times between memory slots).

The unit is shipped in the standard configuration (“Std” appears on the display). In the standard configuration preflow and postflow times are automatically calculated as follows:

Preflow

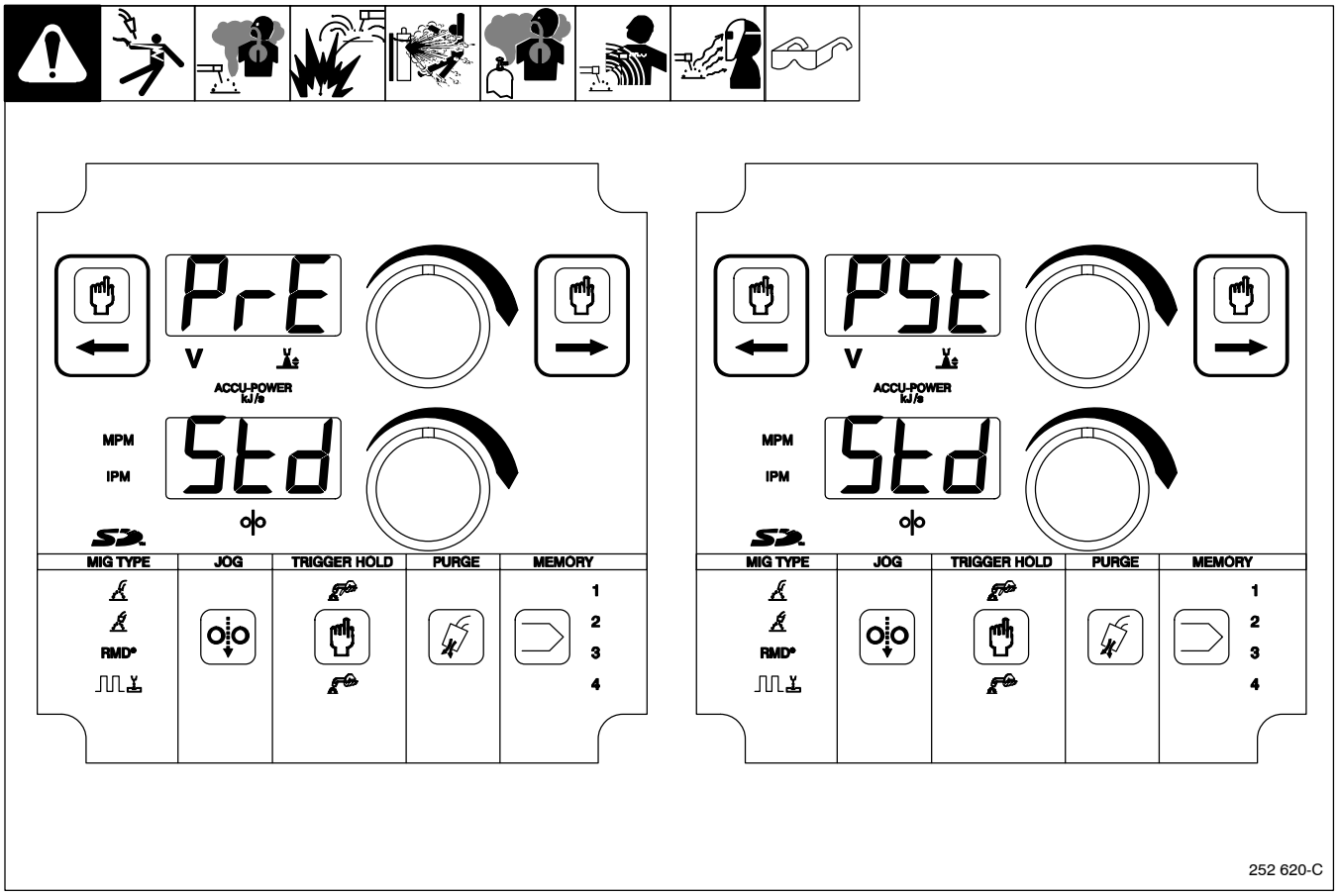
Preflow is only active when in the HF start mode. For TIG, the preflow time is set to 0.1 seconds when in the standard configuration.

For wire processes, the preflow times are fixed at 0.25 seconds which is the default setting in the weld programs.

Postflow

For TIG, the postflow time is a function of output current where the minimum time is 8 seconds from 0 to 175 amps and increases linearly from 8 seconds at 175 amps to 16 seconds at 350 amps.

For wire processes, the postflow time is a function of wire feed speed where the minimum time is 8 seconds from 0 to 9.9 mpm and increases linearly for 8 seconds at 9.9 mpm to 16 seconds at 19.8 mpm.



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To adjust preflow and postflow times, proceed as follows:

1. Select desired output: TIG, LEFT or RIGHT.
2. Press and hold the Purge button, gas solenoid will open.
3. Rotate the Voltage or Wire Feed Speed knob, gas solenoid will close.

   Unit will display PrE on the Voltage display and preflow setting on the Wire Feed Speed display (Std appears if this is the first time).
4. Release the Purge button.
5. Adjust preflow time to desired value by rotate the Wire Feed Speed knob.

   Available selections include Std and numeric values from 0.9 to 10.0 seconds.

   If Trigger Select is enabled, there is a minimum preflow time of 0.25 seconds even if programmed for 0.0 seconds.
6. Rotate the Voltage knob to change from preflow to postflow.

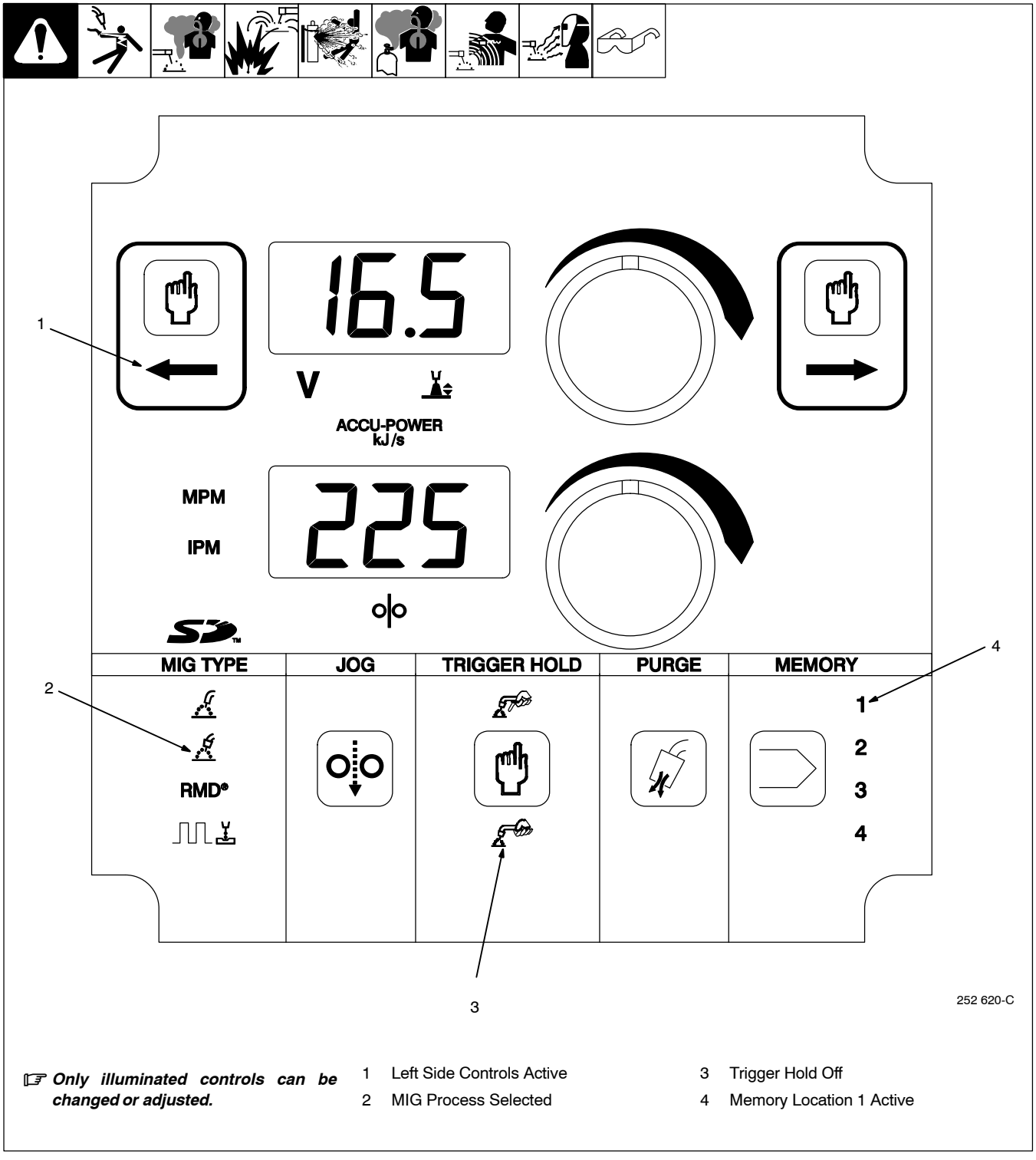
Unit will display PSt on the Voltage display.

7. Adjust postflow time to desired value by rotate the Wire Feed Speed knob.

   Available selections include Std and numeric values from 0 to 60 seconds.

8. Press any button to return to the normal display.

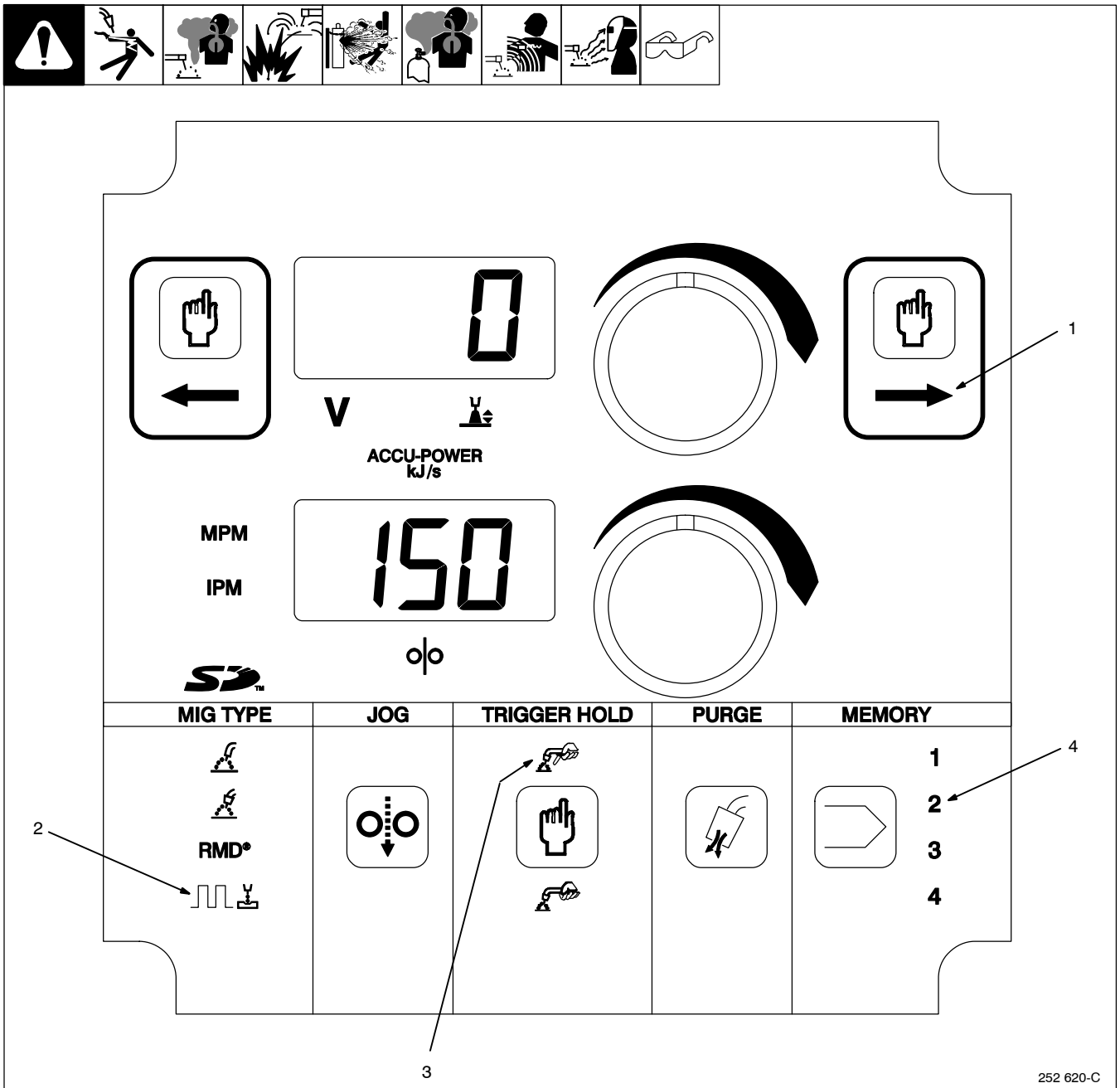
6-11. Wire Feeder Left Side Active Setup Example



☞ ***Only illuminated controls can be changed or adjusted.***

1 Left Side Controls Active
2 MIG Process Selected
3 Trigger Hold Off
4 Memory Location 1 Active

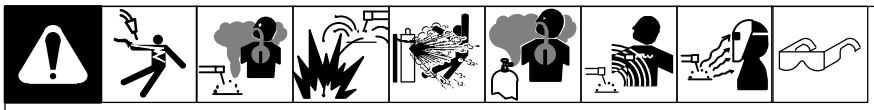
6-12. Wire Feeder Right Side Active Setup Example (Dual Feeder Only)

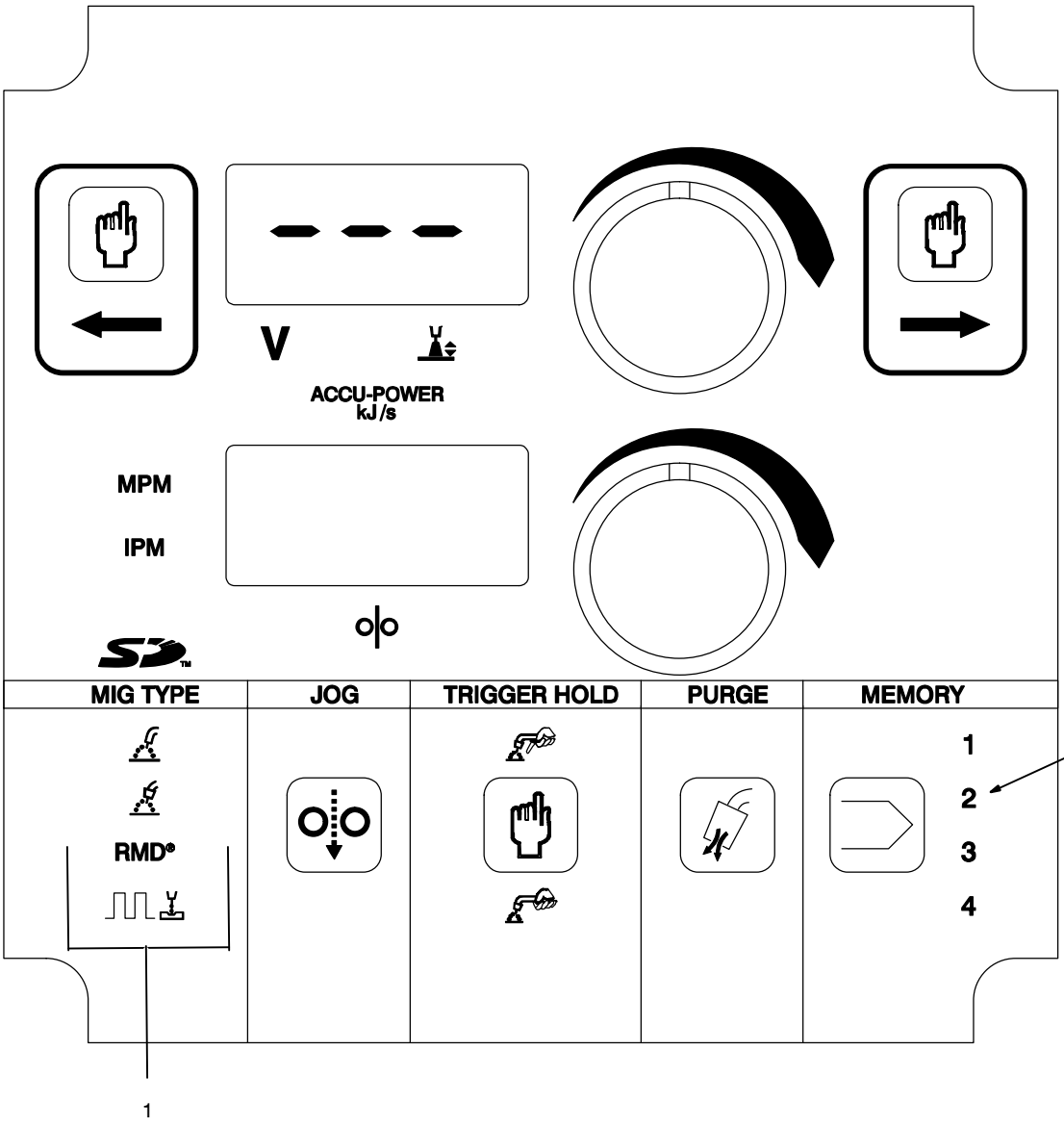


☞ ***Only illuminated controls can be changed or adjusted.***

1 Right Side Controls Active
2 Pulse Process Selected
3 Trigger Hold On
4 Memory Location 2 Active

6-13. Wire Feeder Non-MIG Setup Example



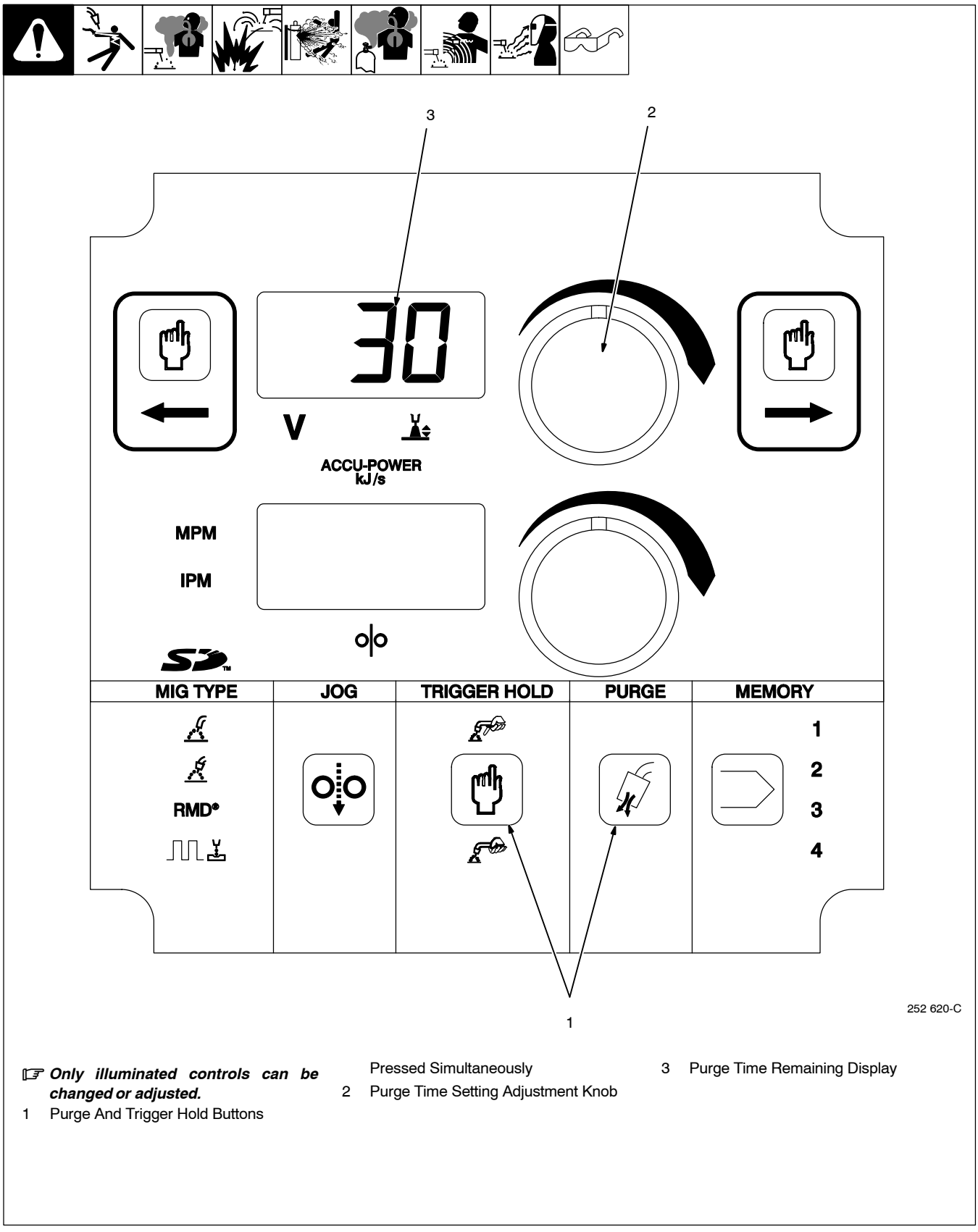


☞ ***Only illuminated controls can be changed or adjusted.***

1 Non-MIG Process Selected

2 Memory Location 3 Active

6-14. Wire Feeder Timed Purge Example



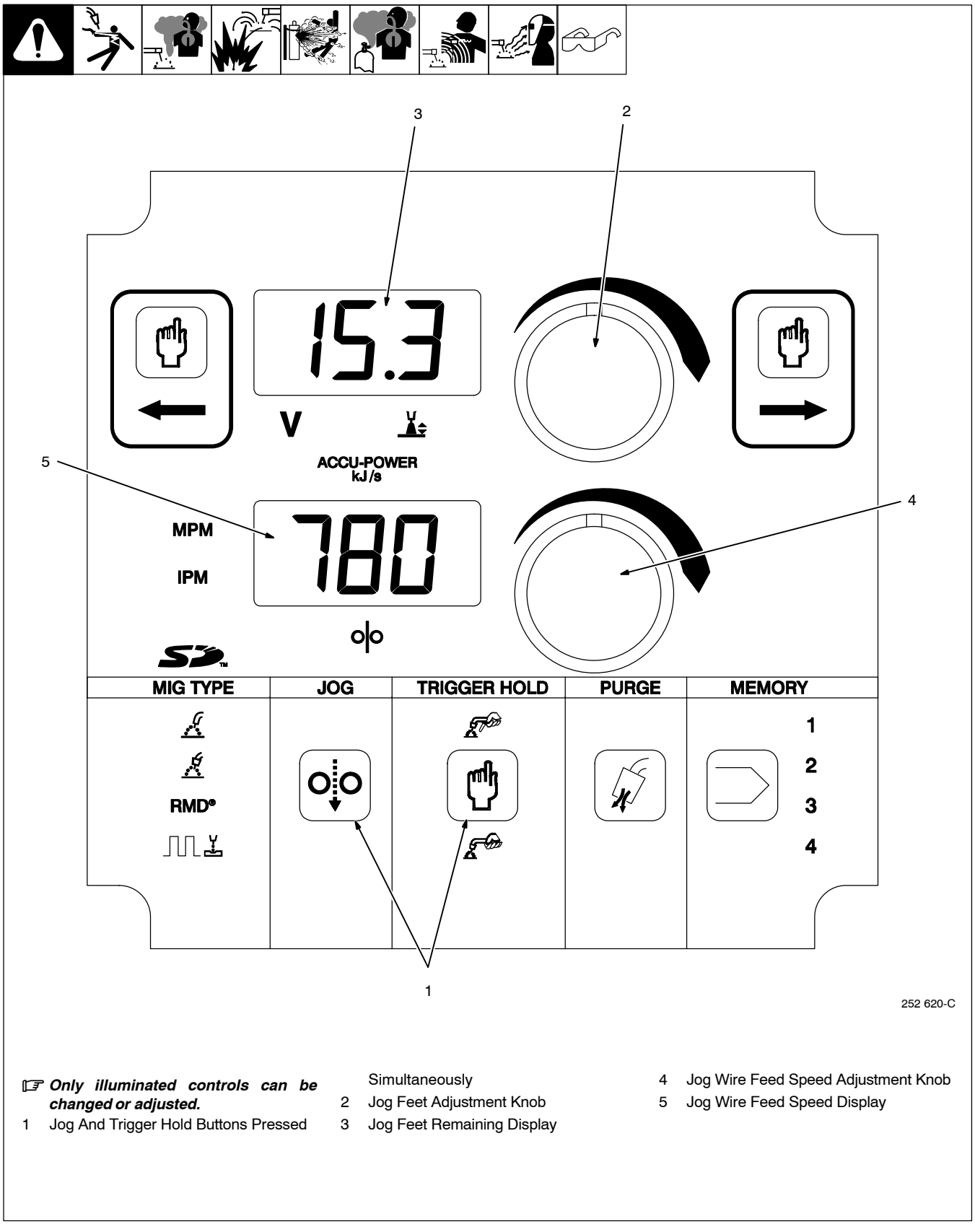
☞ ***Only illuminated controls can be changed or adjusted.***

1 Purge And Trigger Hold Buttons Pressed Simultaneously

2 Purge Time Setting Adjustment Knob

3 Purge Time Remaining Display

6-15. Wire Feeder Auto Jog Example



☞ ***Only illuminated controls can be changed or adjusted.***

1 Jog And Trigger Hold Buttons Pressed Simultaneously

2 Jog Feet Adjustment Knob

3 Jog Feet Remaining Display

4 Jog Wire Feed Speed Adjustment Knob

5 Jog Wire Feed Speed Display

6-16. Basic Parameters For PipeWorx 400

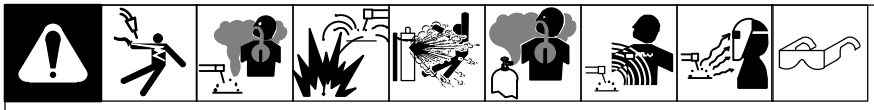
Steel				
Process	**Wire Size mm**	**Wire Feed Speed mpm**	**Arc Length**	**Shielding Gas**
RMD Carbon	0.9	2.5-8.9 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	0.9	2.5-8.9 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	0.9	2.5-8.9 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C25
	0.9	3.8-8.9 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	100% CO_2
	1.0	2.5-6.4 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	1.0	2.5-7.6 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.0	2.5-7.6 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C25
	1.0	3.8-6.4 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	100% CO_2
	1.2	1.9-6.4 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	1.2	1.9-6.4 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.2	1.9-6.4 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C25
	1.2	2.5-5.1 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	100% CO_2
RMD Carbon Metalcore	1.2	1.9-5.7 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.2	1.9-5.7 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C25

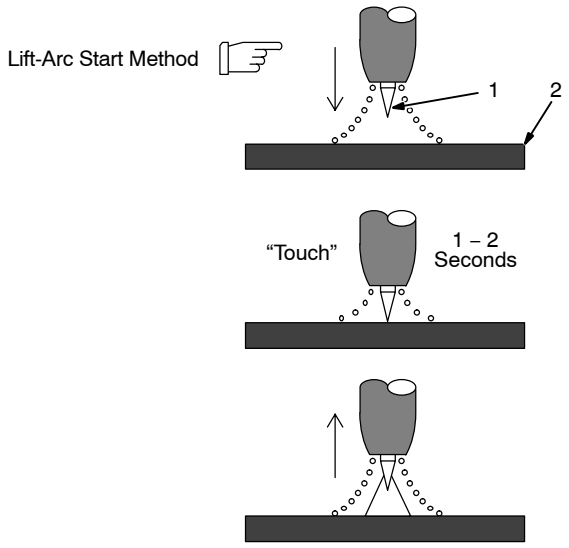
Steel				
Process	**Wire Size mm**	**Wire Feed Speed mpm**	**Arc Length**	**Shielding Gas**
ProPulse Carbon Using A Positioner (Rolling The Pipe)	0.9	2.5-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	0.9	2.5-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.0	2.5-19.8 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	1.0	2.5-19.8 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.2	1.9-12.7 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	1.2	1.9-12.7 w/3.2 Nominal	+3.0 to –3.0 w/zero Nominal	C20
ProPulse Carbon Welding In Position	0.9	2.5-19.8 w/5.7 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	0.9	2.5-19.8 w/5.7 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.0	2.5-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	1.0	2.5-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C20
	1.2	2.5-12.7 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C8-C15
	1.2	1.9-12.7 w/3.2 Nominal	+3.0 to –3.0 w/zero Nominal	C20

Stainless Steel				
Process	**Wire Size mm**	**Wire Feed Speed mpm**	**Arc Length**	**Shielding Gas**
RMD Stainless Steel	0.9	2.5-8.9 W/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	0.9	2.5-8.9 W/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
	1.0	2.5-7.6 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	1.0	2.5-7.6 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
	1.2	1.9-6.4 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	1.2	1.9-6.4 w/3.8 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
ProPulse Stainless Steel Using A Positioner (Rolling The Pipe)	0.9	1.9-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	0.9	1.9-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
	1.0	1.9-19.8 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	1.0	1.9-19.8 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
	1.2	1.9-19.8 w/3.2 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	1.2	1.9-19.8 w/3.2 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
ProPulse Stainless Steel Welding In Position	0.9	2.5-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	0.9	2.5-19.8 w/5.1 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
	1.0	2.5-19.8 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	1.0	2.5-19.8 w/4.4 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox
	1.2	1.9-19.8 w/3.2 Nominal	+3.0 to –3.0 w/zero Nominal	C2
	1.2	1.9-19.8 w/3.2 Nominal	+3.0 to –3.0 w/zero Nominal	98/2 Ox

Flux Core				
Process	**Wire Size mm**	**Rolling Pipe/In Position Wire Feed Speed mpm**	**Voltage**	**Shielding Gas**
Flux Core/GMAW	Not Dependent	1.3-19.8 w/6.4 Nominal*	24.5-32 w/25.0 Nominal	Not Dependent
Note: Arc Length – Length of arc from end of wire to weld puddle. Wire feed speed and voltage are synergic for the RMD and ProPulse processes. This means when adjusting wire feed speed, the voltage is automatically adjusted so it is not necessary to adjust the Arc Length.				
*See wire manufacturer for recommended wire feed speed and gas mixture.				

6-17. Lift-Arc™ And HF TIG Start Procedures





Lift-Arc Start

When Lift-Arc™ button light is On, start arc as follows:

1 TIG Electrode

2 Workpiece

Touch tungsten electrode to workpiece at weld start point, enable output and shielding gas with torch trigger, foot control, or hand control (if a remote control is connected). **Hold electrode to workpiece for 1-2 seconds**, and slowly lift electrode. Arc is formed when electrode is lifted.

Normal open-circuit voltage is not present before tungsten electrode touches workpiece; only a low sensing voltage is present between electrode and workpiece. The solid-state output contactor does not energize until after electrode is touching workpiece. This allows electrode to touch workpiece without overheating, sticking, or getting contaminated.

Application:

Lift-Arc is used for the DCEN or process when HF Start method is not permitted, or to replace the scratch method.

HF Start

When HF Start button light is On, start arc as follows:

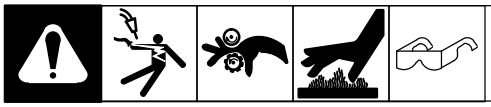
High frequency turns on to help start arc when output is enabled. High frequency turns off when arc is started, and turns on whenever arc is broken to help restart arc.

Application:

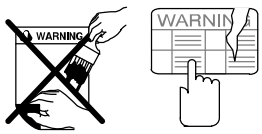
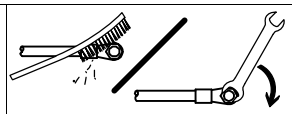
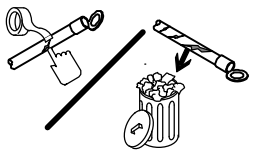
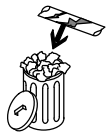
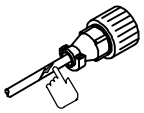
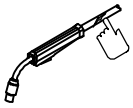
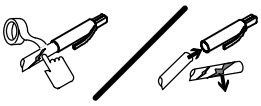
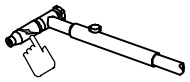
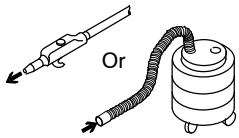
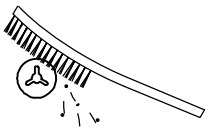
HF start is used for the DCEN GTAW process when a non-contact arc starting method is required.

SECTION 7 – MAINTENANCE AND TROUBLESHOOTING

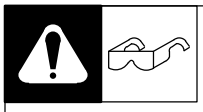
7-1. Routine Maintenance



Disconnect power before maintaining.

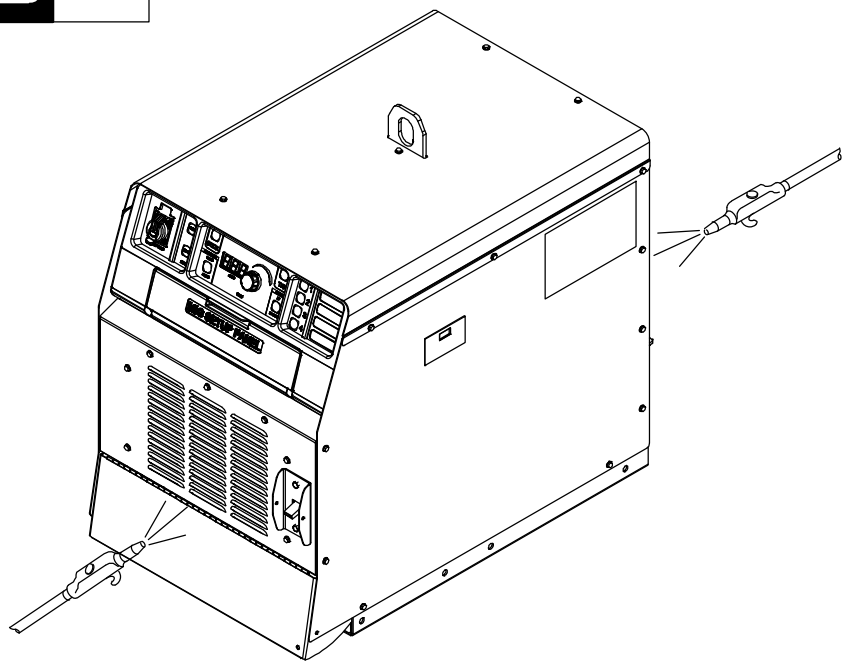
	✓ = Check ◯ = Clean ☆ = Replace			
Every 3 Months	 ☆ Unreadable Labels	 ◯ Weld Terminals	 ✓☆ Weld Cable	 ☆ Cracked Parts
	 ✓ 14-Pin Cord	✓ Gas Hose and Fittings	 ✓ Gun Cable	
	 ☆ Cracked Electrode Holder Parts	 ☆ Cracked Torch Body		
Every 6 Months	 ◯ Inside Unit	 ◯ Drive Rolls		

7-2. Blowing Out Inside of Unit



Do not remove case when blowing out inside of unit.

To blow out unit, direct airflow through front and back louvers as shown.



Ref. 805 142-A

7-3. Restoring Factory Defaults

Full System

A full factory reset can be accomplished by pressing memory location buttons 1 and 4 on the power source simultaneously for more than four seconds. The display will show rSt and then go to dashes when the reset is complete.

Memory Location

See Section 6-2 C2 the reset procedure.

7-4. Viewing Software Revision

Pressing the MIG TYPE and SIDE SELECT buttons behind the door on the power source simultaneously will display the Software Revision.

7-5. Power Source Calibration Procedure

⚠ **Only qualified persons should install, operate, maintain, and repair this unit.**

A. Required Equipment

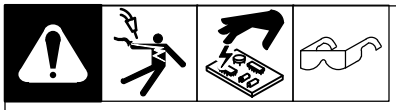
1. Calibrated DC voltmeter and clamp-on DC ammeter (e.g. Fluke 337)
2. Calibration Card
3. Shorting cable (2/0)

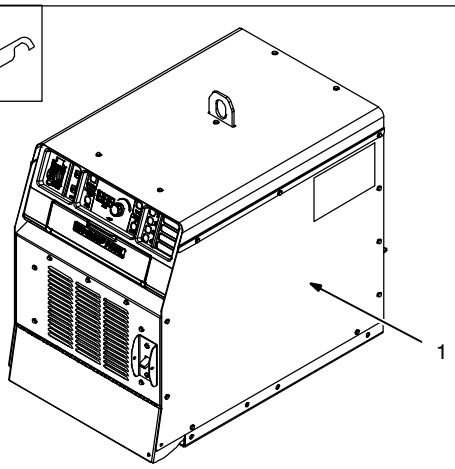
B. Calibration Procedure

1. Disconnect cables from all output studs.
2. Turn on power to the welding system.
3. Insert Calibration card.
    a. Lift and hold memory card access cover open.
    b. Insert memory card into slot (push card all the way into slot and then release).
    c. Close memory card access cover.
    d. Power source will display CAL.
4. Calibrate MIG voltage as follows:
    a. Connect voltmeter from MIG stud (on rear of unit) to Work stud (front center).
    b. Press memory 1 button on the power source front panel. Open circuit voltage should now be present from MIG output stud to the Work stud.
    c. Using the knob on the power source front panel, set the display voltage to the measured value on the voltmeter.
    d. Press memory 1 button on the power source front panel to end the MIG voltage calibration.
    e. Power source will display CAL.
5. Calibrate TIG voltage as follows:
    a. Connect voltmeter from Work stud (front center) to TIG stud (front right).
    b. Press memory 2 button on the power source front panel. Open circuit voltage should now be present from TIG output stud to the Work stud.
    c. Using the knob on the power source front panel, set the display voltage to the measured value on the voltmeter.
    d. Press memory 2 button on the power source front panel to end the TIG voltage calibration.
    e. Power source will display CAL.

6. Calibrate STICK voltage as follows:
    a. Connect voltmeter from STICK stud (front left) to Work stud (front center).
    b. Press memory 3 button on the power source front panel. Open circuit voltage should now be present from STICK output stud to the Work stud.
    c. Using the knob on the power source front panel, set the display voltage to the measured value on the voltmeter.
    d. Press memory 3 button on the power source front panel to end the STICK voltage calibration.
    e. Power source will display CAL.
7. Calibrate amperage as follows:
    a. Connect shorting cable from STICK stud (front left) to Work stud (front center).
    b. Attach clamp-on ammeter around shorting cable.
    c. Press memory 4 button on the power source front panel. Amperage should now be flowing in the shorting cable.
    d. Using the knob on the power source front panel, set the display amperage to the measured value on the ammeter.
    e. Press memory 4 button on the power source front panel to end the amperage calibration.
    f. Power source will display CAL.
    g. Disconnect shorting cable.
8. Remove Calibration card as follows:
    a. Lift and hold memory card access cover open.
    b. Push in and release memory card to eject card.
    c. Grasp memory card and remove from slot.
    d. Close memory card access cover.
9. Turn off power to the welding system.

7-6. Removing Right Side Panel and Measuring Input Capacitor Voltage





Turn Off welding power source, and disconnect input power.

Significant DC voltage can remain on capacitors after unit is Off. Always check the voltage as shown to be sure the input capacitors have discharged before working on unit.

Turn Off welding power source, and disconnect input power.

1 Right Side Panel

To remove panel, remove screws securing panel to unit.

2 Relinking Board PC10

3 Voltmeter

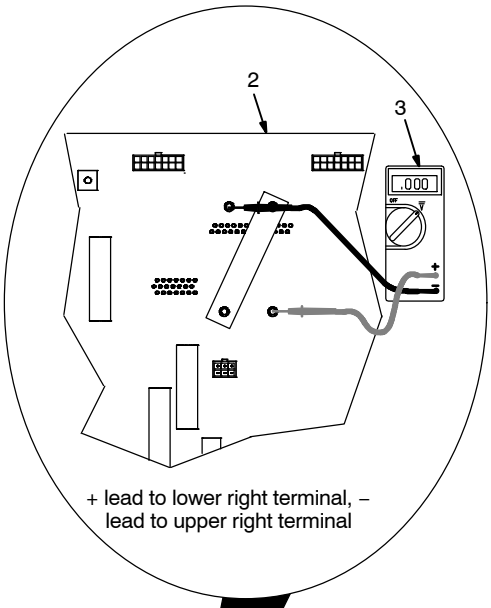
Measure the dc voltage across the screw terminals on PC10 as shown until voltage drops to near 0 (zero) volts.

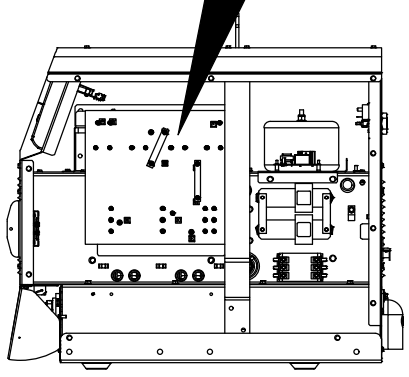
☞ *If the capacitor voltage does not drop to near zero after several minutes, use a bleeder resistor of between 25 and 1000 ohms, at least 5 watts, #16 AWG 1000 volts DC insulating rating wire to discharge the capacitor(s).*

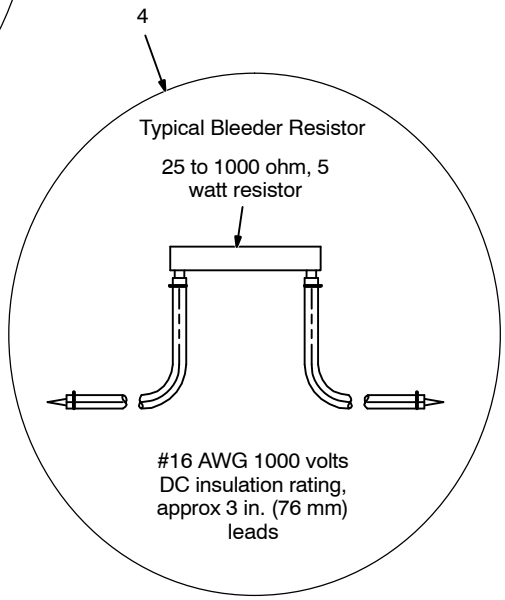
4 Typical Bleeder Resistor

An example of a typical bleeder resistor is shown on this page.

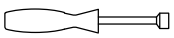
Proceed with job inside unit. Reinstall right side panel when finished.







Tools Needed:



5/16 in.

Ref. 805 142-A / Ref. 805 145-A

7-7. Welding Power Source And Feeder Diagnostic Help Codes

Display Example

Display Code	Fault	Description
H01	Primary Power Circuit Over Current	Indicates a malfunction in the primary power circuit. If this code appears on the display, contact the nearest Factory Authorized Service Agent.
H02	Temperature Sensor Malfunction	Indicates thermal protection circuitry is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.
H03	Secondary Circuit Over Temperature	Indicates left side of unit has overheated. Unit has shutdown to allow fans to lower left side temperature. Operation will continue after unit is within normal temperature range.
H04	Secondary Circuit Over Temperature	Indicates bottom of unit has overheated. Unit has shutdown to allow fans to lower bottom temperature. Operation will continue after unit is within normal temperature range.
H05	Primary Circuit Over Temperature	Indicates right side of unit has overheated. Unit has shutdown to allow fans to lower right side temperature. Operation will continue after unit is within normal temperature range.
H08	Output Over Voltage Malfunction	Indicates secondary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.
H09	Primary Power Circuit Current Detect Malfunction	Indicates primary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.
H10	Primary Power Circuit Control Malfunction	Indicates primary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.
H11	Primary Bus Capacitor Voltage Imbalance	Indicates primary power circuit is malfunctioning. If this code appears on the display, contact the nearest Factory Authorized Service Agent.
H12	Primary Input Line Voltage Malfunction	Indicates input primary line voltage is too low. Increase primary line voltage to at least 90% of specified nominal voltage.
H25	Duty Cycle	Indicates duty cycle limit exceeded. Output stops and the cooling fan will run. Wait 15 minutes for unit to cool. Reduce amperage, voltage, wire feed speed, or duty cycle before welding.
H26	Button Stuck Power Source	Indicates button is stuck on the power source upon start up. Fault will clear when button is released.
H30	Stuck Contactor TIG	Indicates stuck remote contactor in TIG mode. Fault will clear when foot pedal or control device contactor is released.
H31	Stuck Contactor Stick	Indicates stuck remote contactor in Stick mode. Fault will clear when foot pedal or control device contactor is released.
H40	Tach Left	Indicates tach error on left motor. Check left feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H41	Tach Right	Indicates tach error on right motor. Check right feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H42	Motor Left	Indicates motor error on left motor. Check left feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H43	Motor Right	Indicates motor error on right motor. Check right feeder drive housing and wire spool for obstructions. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.

H44	Motor Low Bus	Indicates input primary line voltage is too low. Increase primary line voltage to at least 90% of specified nominal voltage. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H45	Button Stuck Feeder	Indicates button is stuck on the feeder upon feeder power up. Fault will clear when button is released.
H46	Trigger Stuck Left	Indicates left trigger stuck fault. Fault will clear when left trigger is released.
H47	Trigger Stuck Right	Indicates right trigger stuck fault. Fault will clear when right trigger is released.
H48	Trigger Fault Left	Indicates left trigger was held too long in trigger jog (the lesser of 60 seconds or 30 ft (9.1 m) of wire.
H49	Trigger Fault Right	Indicates right trigger was held too long in trigger jog (the lesser of 60 seconds or 30 ft (9.1 m) of wire.
H60	Memory Card Fault	Indicates unable to read memory card. Faulty memory card or wrong format.
H61	File Read Error	Indicates faulty file on memory card.
H62	File Write Error	Indicates full or faulty memory card.
H63	Invalid File	Indicates an invalid file on memory card. The system was able to read the file; however, the contents of the file were invalid. Remove card or press any button to clear error.
H64	Memory Card Locked	Indicates a save was attempted to a locked card. This refers to the physical switch on the memory card. Unlock the memory card and try again. Try a different memory card. Remove card or press any button to clear error. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H65	Read Only File	Indicates a save was attempted to a file that has been marked read-only. Check with the appropriate person to see if the attributes are read only for a reason (the attributes can be altered using a PC). Use a different card. Remove card or press any button to clear error.
H66	No Memory Card Detected	Indicates no memory card detected when a memory card operation was attempted. Insert a card or press any button to clear error. Try a different memory card. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H70	Weld Library	Indicates missing/incomplete weld library in power source. Weld library must be loaded from memory card.
H71	Invalid Model	Indicate if the unit is a standard, IEC, or CE machine.
H98	Serial Communication Loss	Indicates serial communication was initially made and is now malfunctioning. Check wire feeder/power source control cable connection and tighten if necessary. May appear normally during firmware updates. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.
H99	Serial Communication Malfunction	Indicates serial communication is malfunctioning. Check wire feeder/power source control cable connection and tighten if necessary. May appear normally during firmware updates. If this code continues to appear on the display, contact the nearest Factory Authorized Service Agent.

7-8. Troubleshooting Welding Power Source/Wire Feeder Issues

If the welding power source and wire feeder are NOT responding after everything is connected, follow the items listed below before contacting the nearest factory-authorized service agent:

Welding power source is plugged in and there is no power after turning on unit.

- If unit is directly connected to a line disconnect box or plugged into a receptacle from a line disconnect box, be sure that the line disconnect switch or main breaker is in the ON position.

Wire does not feed from wire feeder to end of gun.

- Check to see if wire diameter matches the groove size of the drive rolls.
- Check if tension on drive rolls is too loose or too tight.
- Check if gun liner is the correct size for the wire size.
- Check if contact tip is correct size for the wire size, and that end of contact tip is not plugged.
- Check if gun end is fully inserted into wire drive housing at feeder, and knob is tightened down to secure gun end.

Weld is not consistent from one welding application to another.

- Be sure that work clamp is connected to a clean, paint-free area of pipe; otherwise, grind an area if necessary to make a good work connection.
- Keep work clamp as close as possible to joint being welded.
- Check if volt sensing lead is connected to the welding power source and that work connection is secure. Check for any frayed wires at work end of volt sensing lead that may prevent a good connection.
- Be sure that volt sense lead is separated from weld cables.
- Be sure gun angle during welding is straight in to 15 degrees back at joint.
- Follow recommended settings in Operation section of manual to select a starting point for welding.
- Recommended joint preparation and fit-up is 1/32-1/16 in (0.8-1.6 mm) land and a 1/8 in (3.2 mm) root opening.
- Refer to Pipe Welding Techniques DVD.

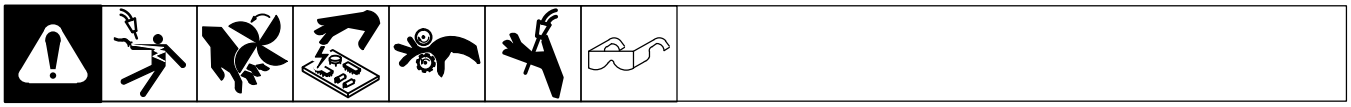
Porosity in weld bead.

- Check shielding gas supply that there is enough gas and supply is turned on.
- Check shielding gas flow rate at regulator.
- Check that gas pressure to the wire feeder does not exceed 90 psi (621 kPa).
- Check all shielding gas fitting and tighten if necessary.
- Remove gun end from wire drive housing and check condition of O-rings. Replace any worn or missing O-rings.
- Check power pin end of gun and tighten with a wrench.
- Be sure that gun end is fully inserted into wire drive housing and knob is tightened down to secure gun end.
- Check and clean shielding gas nozzle on gun.
- Shield joint from wind.

Trouble feeding wire when welding. Check drive rolls and wire guides to make sure they match the wire style and size.

- Check drive roll tension and readjust if necessary.
- Be sure that gun end is fully inserted into wire drive housing and knob is tightened down to secure gun end.
- Check if hub tension at wire spool is too tight or too loose and readjust if necessary.
- Be sure that welding gun cable is as straight as possible from wire feeder to workpiece.
- Check if contact tip is correct size for the wire size, and that end of contact tip is not plugged.
- Check if gun liner is the correct size for the wire size and liner is not dirty or damaged. Clean or replace gun liner if necessary.

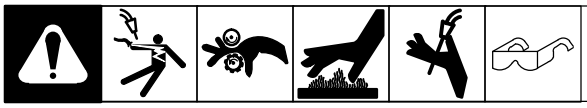
7-9. Welding Power Source Troubleshooting



Trouble	Remedy
No weld output; unit completely inoperative.	Place line disconnect switch in On position (see Section 5-11).
	Check and replace line fuse(s), if necessary, or reset circuit breaker (see Section 5-11).
	Check for proper input power connections (see Section 5-11).
No weld output; meter display On.	Check, repair, or replace remote control.
	Unit overheated. Allow unit to cool with fan On (see Section 4-4).
	Check voltmeter/ammeter Help displays.
Erratic or improper weld output.	Use proper size and type of weld cable (see Section 5-16).
	Clean and tighten all weld connections.
	Check volt sense lead. Straighten any coiled cables.
No 115 volts AC output at single receptacle.	Reset supplementary protector CB1 (see Section 5-8).
No 24 volts AC output at Remote 14 Feeder receptacle.	Reset supplementary protector CB2 (see Section 5-7).
When remote control is connected to unit output is always on.	Check remote control switch and potentiometer resistances.

Notes

7-10. Wire Feeder Troubleshooting

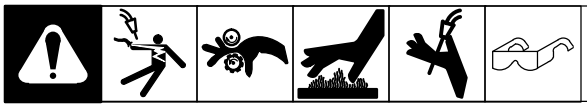


Disconnect power before troubleshooting.

Trouble	Remedy
Wire feeds, shielding gas flows, but electrode wire is not energized.	Check cable connections. Check cables for continuity, and repair or replace cables if necessary.
Wire feeder is on, display does not light up, motor does not run, gas valve and welding power source contactor do not pull in.	Check and reset circuit breaker at welding power source.
Electrode wire feeding stops, or feeds erratically during welding.	Check gun trigger connection. See gun Owner's Manual.
	Check gun trigger. See gun Owner's Manual.
	Readjust hub tension and drive roll pressure (see Section 5-22).
	Change to correct size drive roll (see Table 9-1).
	Clean or replace dirty or worn drive roll.
	Incorrect size or worn wire guides.
	Replace contact tip or liner. See gun Owner's Manual.
	Remove weld spatter or foreign matter from around nozzle opening.
	Have Factory Authorized Service Agency check drive motor or motor control board PC1.
Motor runs slowly.	Check for correct input voltage.
Wire feeder displays light up, feeder jogs, purges, but unit is inoperative.	Check welding gun trigger leads for continuity, and repair leads or replace gun.
When triggered, wire feeds but no gas, no contactor.	If the welding arc does not establish in 2 seconds after the gun trigger is activated the unit will feed wire, but turns off contactor and gas valve. If the gun trigger is still activated after 60 seconds or 30 ft (9.1 m) of wire was fed from the gun, the wire will stop feeding.

Notes

7-11. Cooler Troubleshooting



Disconnect power before troubleshooting.

Trouble	Remedy
Coolant system does not work.	Be sure input power cord is plugged into energized receptacle.
	Check supplementary protector CB1 at welding power source, and reset if necessary.
	Motor overheated. Unit starts running when motor has cooled.
	Have Factory Authorized Service Agent check motor.
Decreased or no coolant flow.	Add coolant.
	Check for clogged hoses or coolant filter.
	Disconnect pump, and check for sheared coupling. Replace coupling if necessary.

Notes

Notes

SECTION 8 – ELECTRICAL DIAGRAM

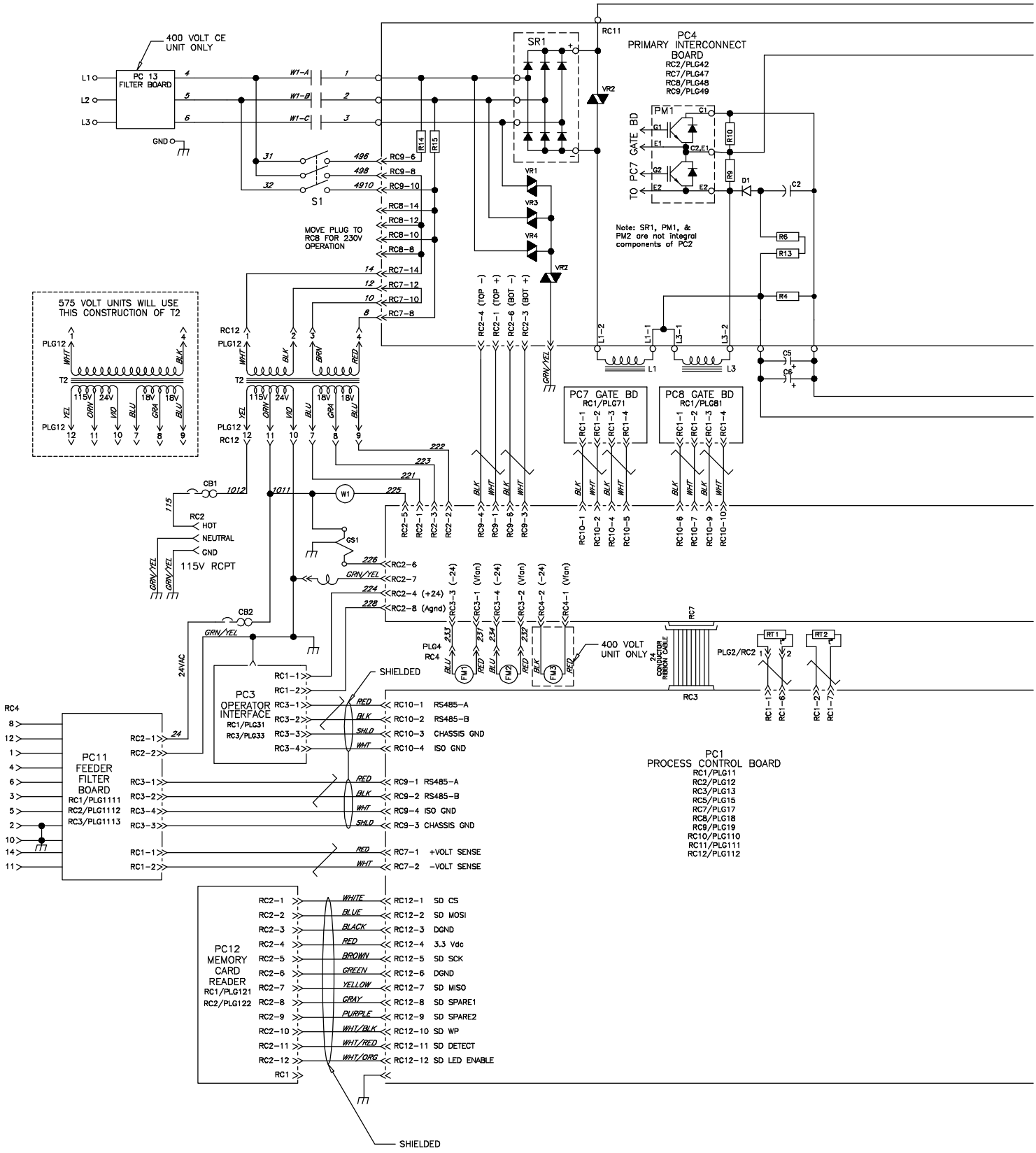
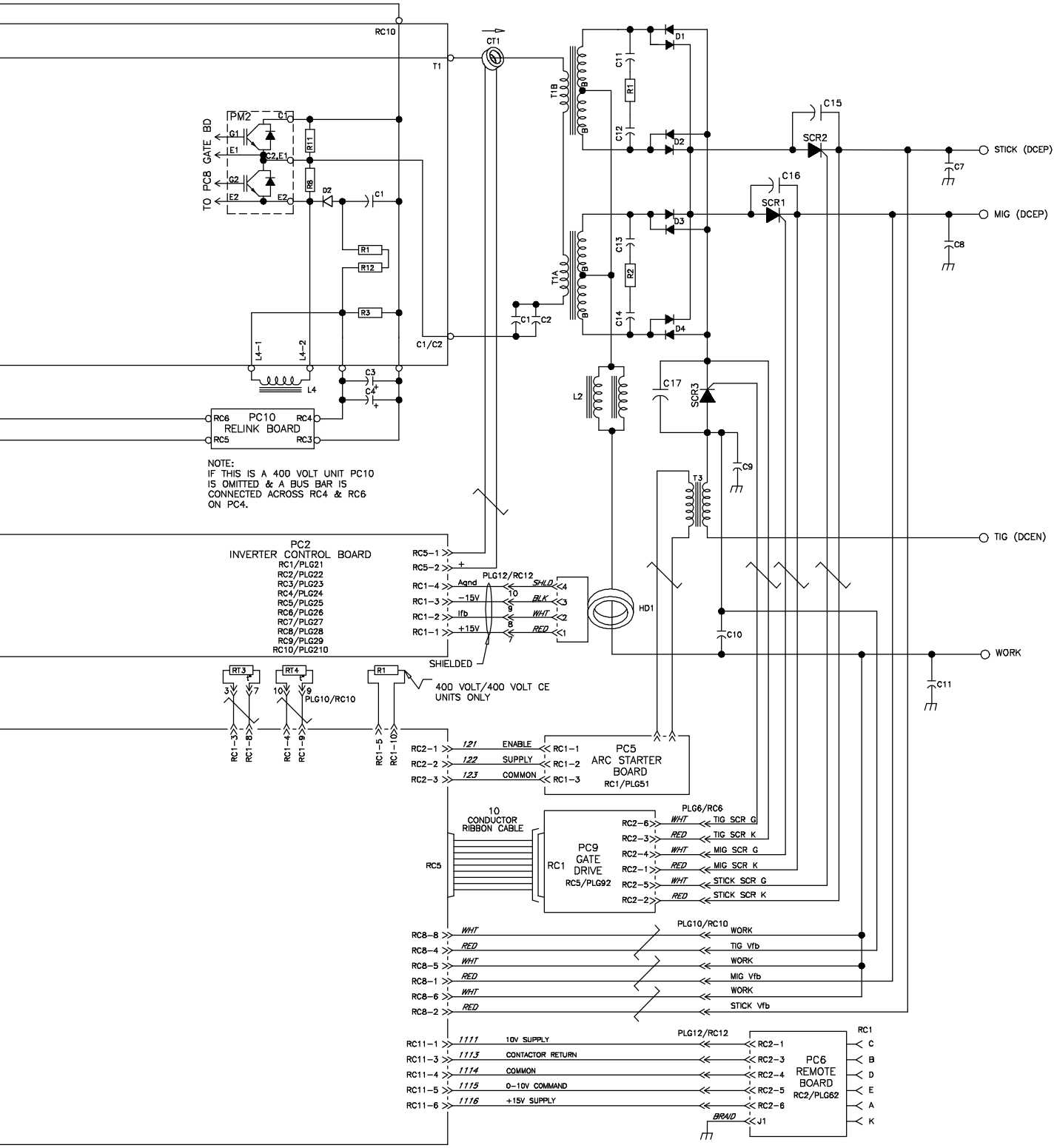


Figure 7-1. Circuit Diagram For Welding Power Source

⚠ WARNING	• Do not touch live electrical parts. • Disconnect input power or stop engine before servicing. • Do not operate with covers removed. • Have only qualified persons install, use, or service this unit.
ELECTRIC SHOCK HAZARD	



254 310-B

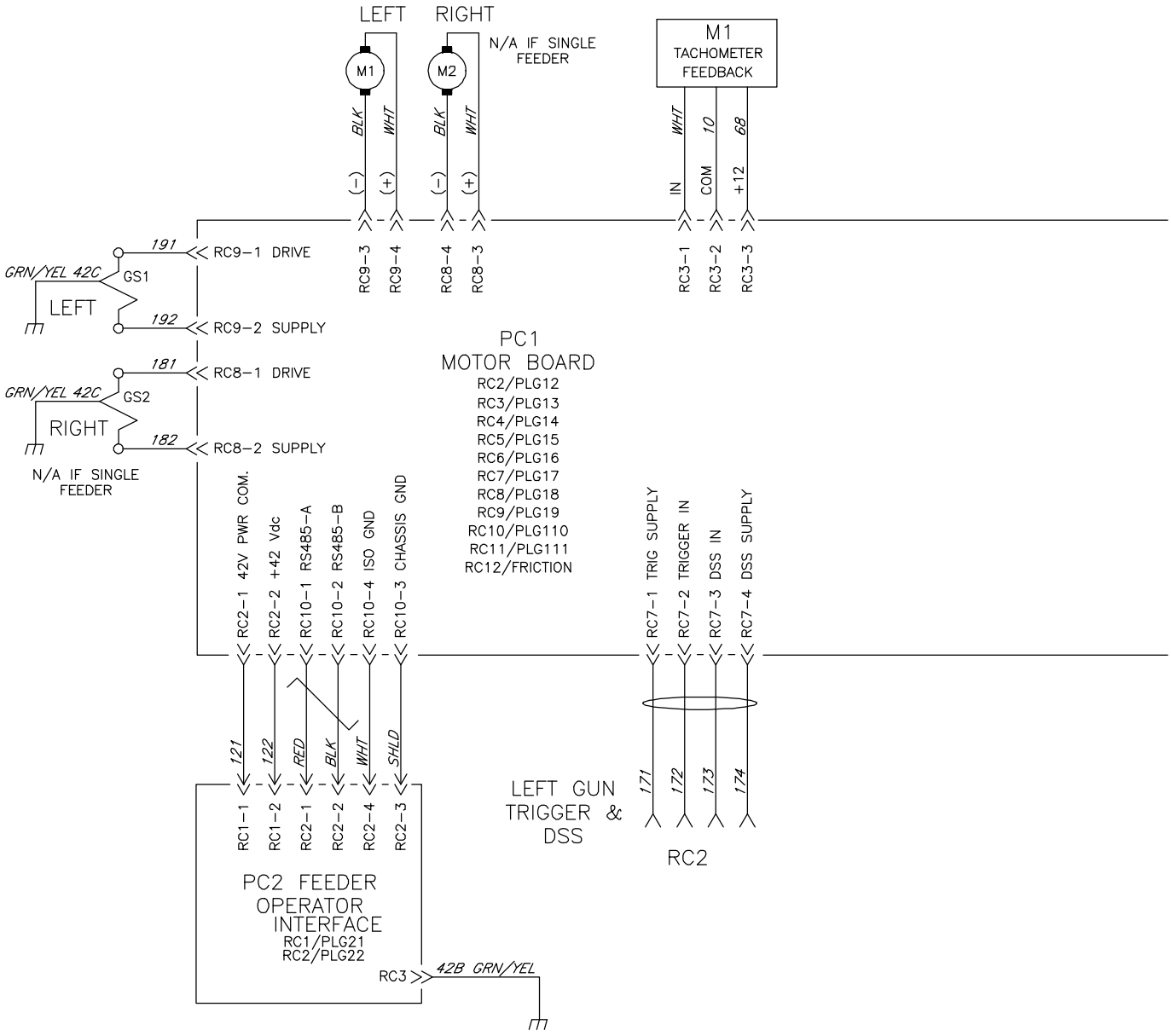
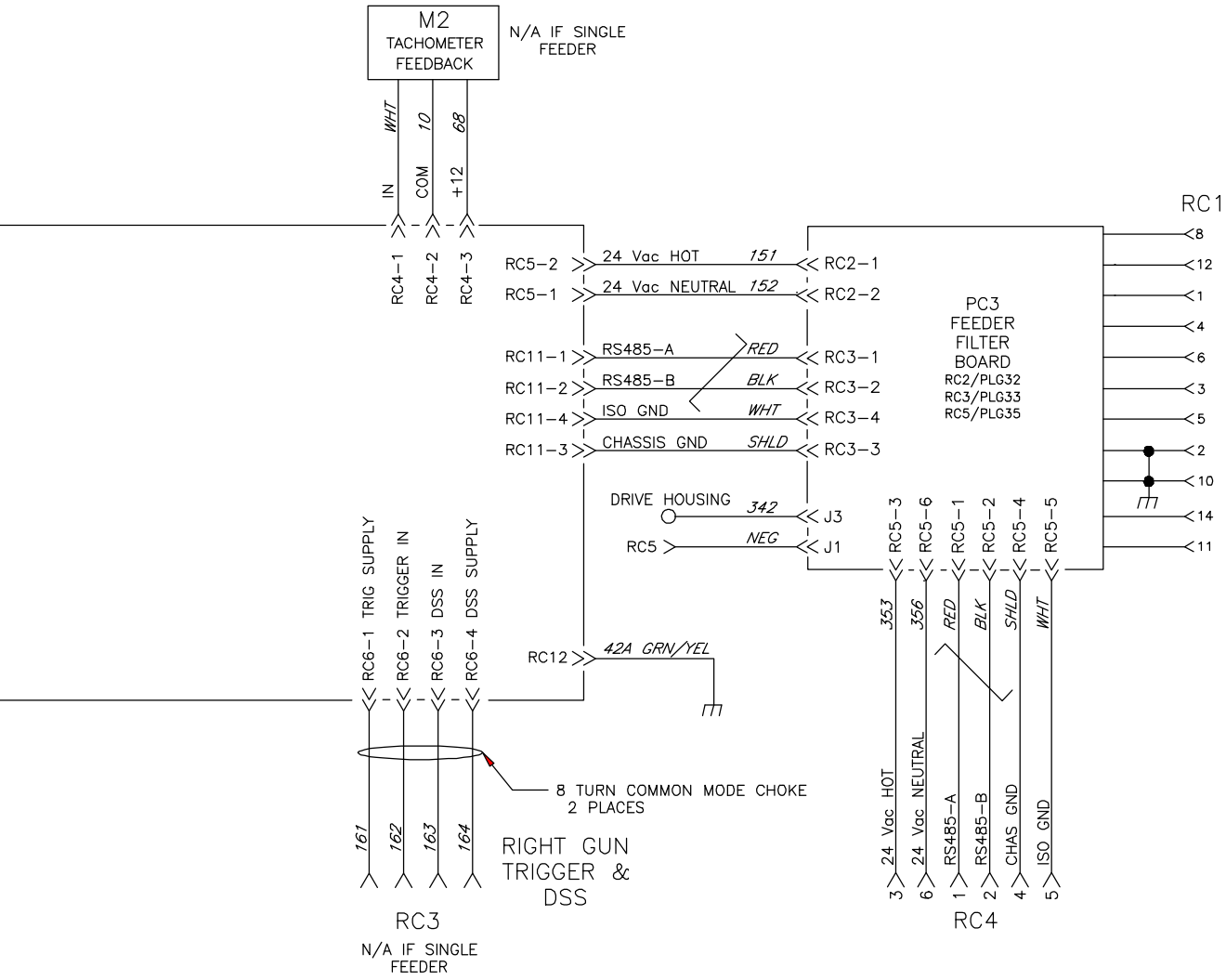


Figure 7-2. Circuit Diagram For Single Or Dual Wire Feeder

⚠ WARNING

ELECTRIC SHOCK HAZARD

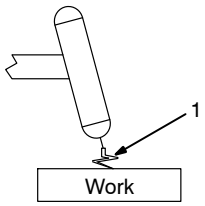
- Do not touch live electrical parts.
- Disconnect input power or stop engine before servicing.
- Do not operate with covers removed.
- Have only qualified persons install, use, or service this unit.



236 220-E

SECTION 9 – HIGH FREQUENCY

9-1. Welding Processes Requiring High Frequency



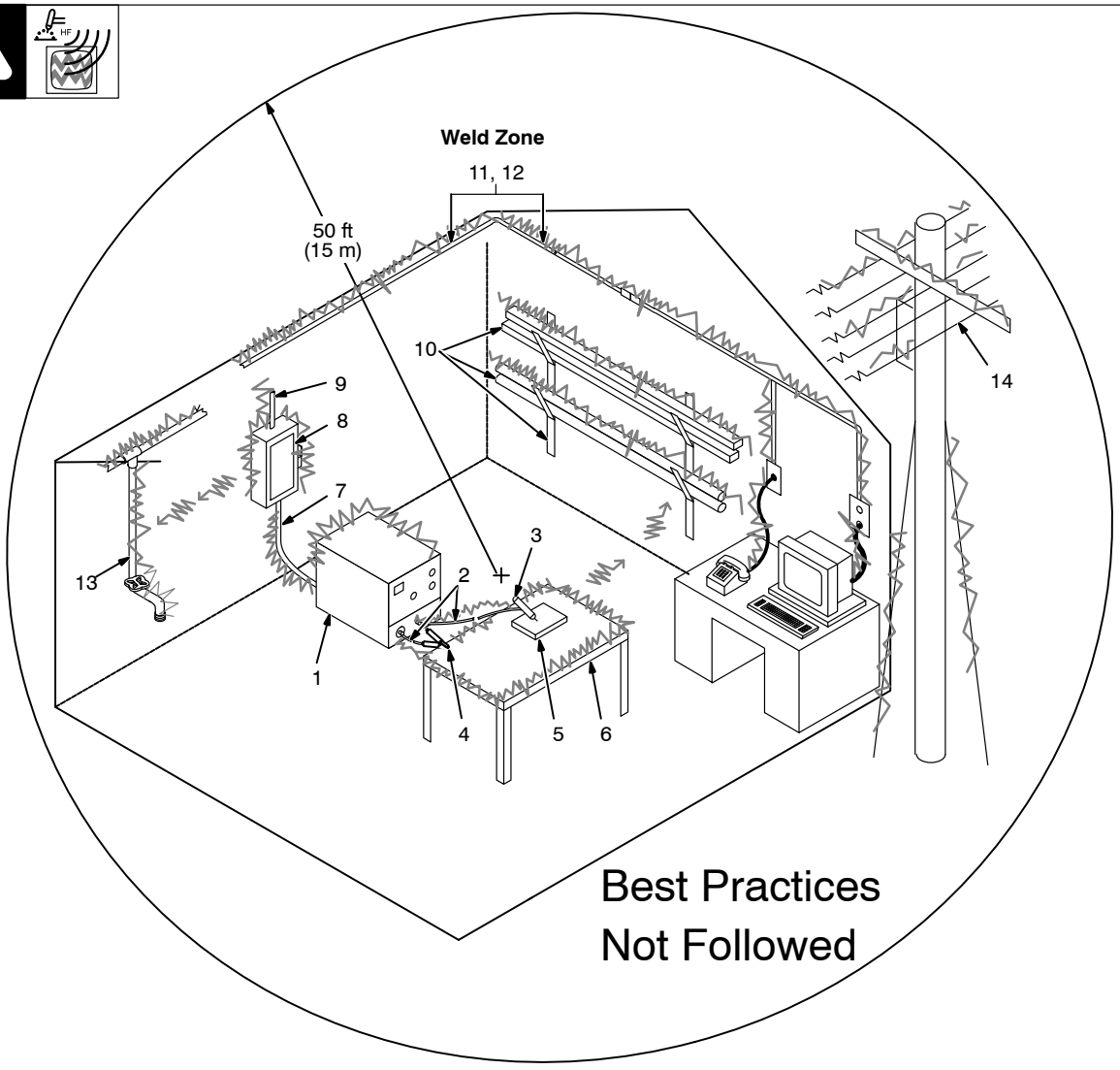
TIG

1 High-Frequency Voltage

TIG – helps arc jump air gap between torch and workpiece and/or stabilize the arc.

high_freq 5/10 – S-0693

9-2. Installation Showing Possible Sources Of HF Interference



Sources of Direct High-Frequency Radiation

1 High-Frequency Source (welding power source with built-in HF or separate HF unit)
2 Weld Cables
3 Torch
4 Work Clamp
5 Workpiece
6 Work Table

Sources of Conduction of High Frequency

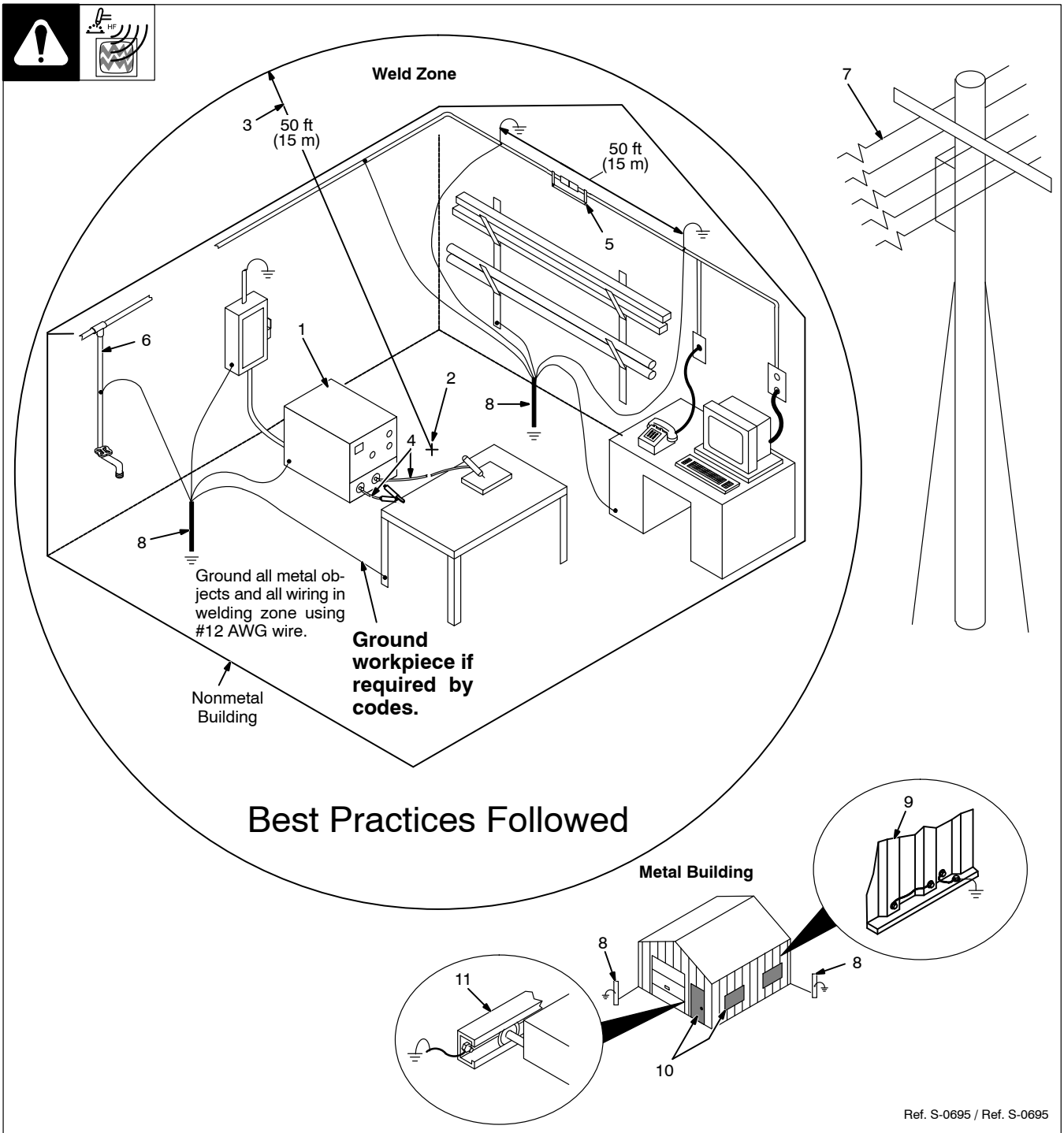
7 Input Power Cable
8 Line Disconnect Device
9 Input Supply Wiring

Sources of Reradiation of High Frequency

10 Ungrounded Metal Objects
11 Lighting
12 Wiring
13 Water Pipes and Fixtures
14 External Phone and Power Lines

S-0694

9-3. Recommended Installation To Reduce HF Interference



Ref. S-0695 / Ref. S-0695

1 High-Frequency Source (welding power source with built-in HF or separate HF unit)

Ground metal machine case (clean paint from around hole in case, and use case screw), work output terminal, line disconnect device, input supply, and worktable.

2 Center Point of Welding Zone

Midpoint between high-frequency source and welding torch.

3 Welding Zone

A circle 50 ft (15 m) from center point in all directions.

4 Weld Output Cables

Keep cables short and close together.

5 Conduit Joint Bonding and Grounding

Electrically join (bond) all conduit sections using copper straps or braided wire. Ground conduit every 50 ft (15 m).

6 Water Pipes and Fixtures

Ground water pipes every 50 ft (15 m).

7 External Power or Telephone Lines

Locate high-frequency source at least 50 ft (15 m) away from power and phone lines.

8 Grounding Rod

Consult the National Electrical Code for specifications.

Metal Building Requirements

9 Metal Building Panel Bonding Methods

Bolt or weld building panels together, install copper straps or braided wire across seams, and ground frame.

10 Windows and Doorways

Cover all windows and doorways with grounded copper screen of not more than 1/4 in (6.4 mm) mesh.

11 Overhead Door Track

Ground the track.

☞ *Hardware is common and not available unless listed.*

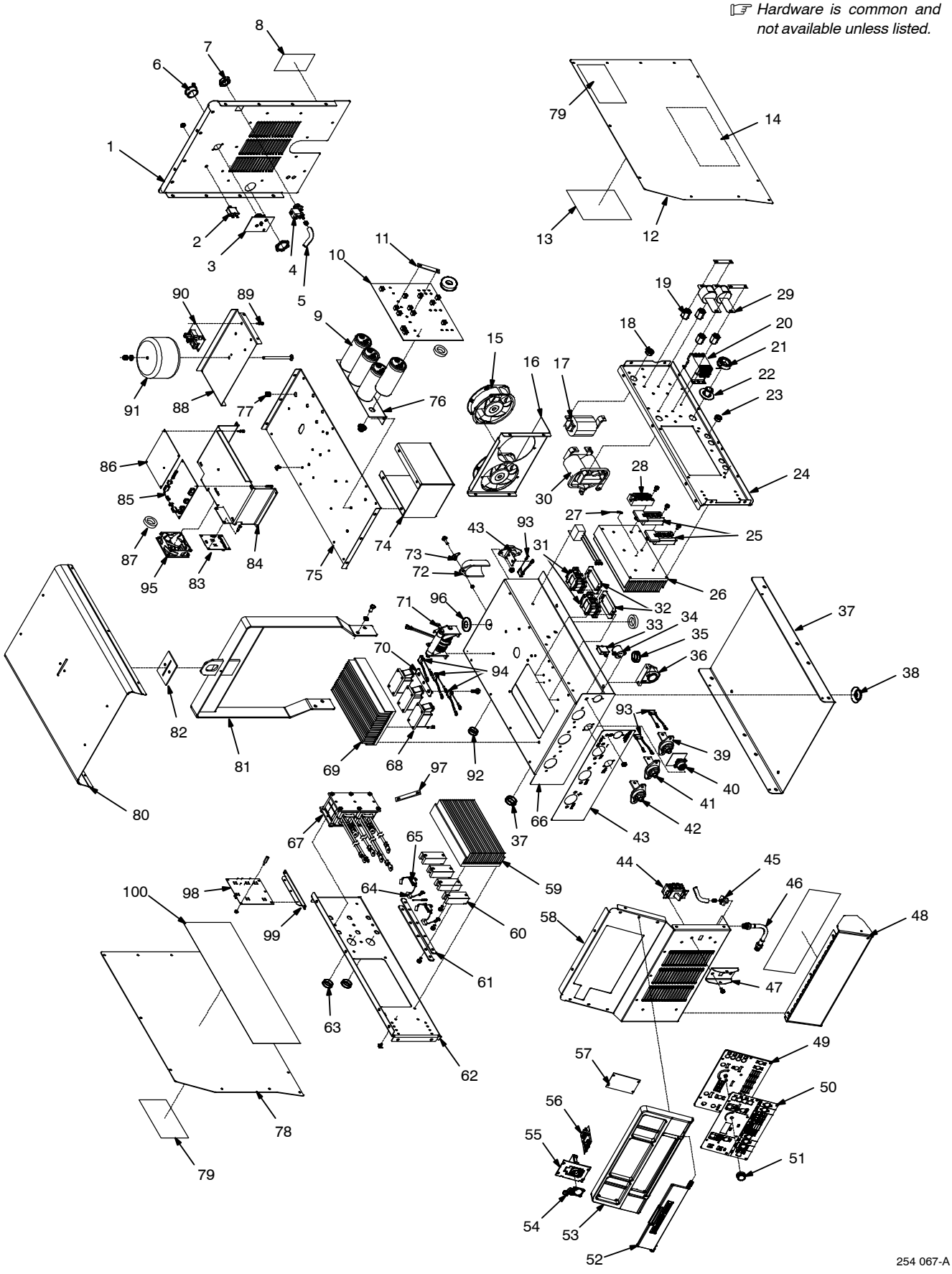


Figure 9-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-1. Main Assembly

1		+250832	Panel, Rear	1
2	CB2	093995	Supplementary Pro, Man Reset 1P 15A 250VAC Frict	1
3	PC11	244471	Circuit Card Assy, PS/Feeder Interface	1
4		228036	Valve, 24VAC 1way .750−14 Thd 2.0mm Orf 100 PSI	1
5		236638	Hose, Nprn Brd No 1 x .187 ID x 40.000	1
6		010467	Conn, Clamp Cable 1.250	1
7		220805	Nut, 750−14 NPS 1.48Hex .41h Nyl	1
8		181181	Label, Warning Match Input Power To Voltage	1
		237163	Label, MIG Output	1
		237157	Label, CB2	1
		238560	Label, TIG Gas In	1
		254053	Label, To Wirefeeder	1
9	C3, C4, C5, C6	192935	Capacitor, Elctlt 2700 uf 450 VDC Can 2.52 Dia	4
		218004	Label, Warning Electric Shock/Exploding Parts	3
		217040	Nut, Nylon M12 Thread Capacitor Mounting	4
10	PC4	231559	Circuit Card Assy, Interconnecting	1
11		185214	Bus Bar, Interconnecting	1
12		+240841	Panel, Side RH	1
13		237155	Label, Important Input Power/Relink Connections	1
14		234271	Sheet, Insulator Side Panel	1
15	FM1, FM2	222728	Fan, Muffin 24VDC 3000 RPM 255 CFM	2
16		233501	Bracket, Fan	1
17	L1	180026	Inductor, Input	1
			Windtunnel, RH w/Cmpnts (Includes)	1
18		030170	.... Bushing, Snap−In Nyl .750 ID x 1.000 Mtg Hole	2
19		025248	.... Stand−Off, Insul .250−20 x 1.250 Lg x .437 Thd	4
20	W1	180270	.... Contactor, Def Prp 40A 3P 24VAC Coil w/Boxlug	1
21	CT1	233620	.... Xfmr, Current 500 Turn Polarized	1
22		177547	.... Bushing, Snap−In Nyl Ct−Mount 1.125 Mtg Hole	1
23		010493	.... Bushing, Snap−In Nyl .625 ID x .875 Mtg Hole	4
24		233462	.... Windtunnel, RH	1
25	PM1, PM2	240144	.... Kit, Transistor IGBT Module	1
26		179930	.... Heat Sink, Power Module	1
27	RT1	173632	.... Thermistor, Ntc 30k ohm @ 25 Deg C 12.00 in Lead	1
28	SR1	249052	.... Kit, Rectifier, Integ Bridge	1
29	C1, C2	230273	Capacitor, Polyp Film .5 uf 1000 VRMS +/−10%	2
30	L2	233438	Inductor, Output	1
31	L3, L4	233617	Inductor, DI−DT	2
32		218566	Gasket, Inductor Mounting E70 Ferrite Core	2
33	CB1	083432	Supplementary Pro, Man Reset 1P 10A 250VAC Frict	1
34	RC2	134837	Rcpt, Str Grd 2P3W 15A 125V Single *5−15R	1
35		170647	Bushing, Snap−In Nyl 1.312 ID x 1.500 Mtg Hole	2
36	HD1	168829	Transducer, Current 1000A Module	1
37		234358	Base, w/ Pem Nuts	1
38		229325	Foot, Mtg Unit	4

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-1. Main Assembly (Continued)

39		210866	Terminal, Pwr Output Black	1
40	PC6	244459	Circuit Card Assy, Remote Interface	1
41		182665	Terminal, Pwr Output Neutral	1
42		210865	Terminal, Pwr Output Red	2
43		236968	Overlay, Secondary Panel	1
44		231191	Switch, Tgl 3PST 50A 600VAC SCR Term Wide Tgl	1
		176226	Insulator, Switch Power	1
45		120854	Ftg, Gas	1
46		237415	Hose, Gas Braided 5 in	1
47		236596	Plate, Switch	1
48		241087	Cover, Output Stud w/Labels (Includes)	1
		238574	Label, Connection Secondary Panel	1
		238535	Label, Pipeworx 400	1
49	PC3	244441	Circuit Card Assy, UI w/Program PS	1
50		252613	Overlay, Power Source	1
51		174991	Knob, Pointer 1.250 Dia x .250 ID w/Spring Clip−.21	1
52		236828	Door, Bezel, Mig Setup	1
53		234497	Bezel, Power Source	1
54		236830	Door, SD Reader	1
55		234344	Bracket, SD Card Reader	1
56	PC12	244447	Circuit Card Assy, SD Card	1
57		236748	Whiteboard, Magnetic	1
58		233479	Panel, Front	1
		212810	Label, On−Off w/Symbols	1
			Windtunnel, LH w/Cmpnts (Includes)	1
59		233910	Heat Sink, Power Module	1
60	D1, D2, D3, D4	249053	Kit, Diode, Ultra−Fast Recovery	4
61		233490	Bus Bar, Diode	2
62		233461	Windtunnel, LH	1
63		057358	Bushing, Snap−In Nyl 1.000 ID x 1.375 Mtg Hole	2
64	RT2	222327	Thermistor, NTC 30k ohm @ 25 Deg C 24.00 in Lead	1
65		254046	Resistor/Capacitor Assy	2
66		233911	Windtunnel Bottom, w/ Pem Nuts	1
67	T1	247618	Xfmr, HF	1
68	SCR1, SCR2,SCR3	249352	Kit, Thyristor, SCR Module	3
	RT3,RT4	234339	Thermistor, NTC 30k ohm @ 25 Deg C 12.00 in Lead	2
69		234056	Heat Sink, SCR Polarity Switching	1
70		234279	Bus Bar, SCR	1
71		252520	Coil, HF Coupling	1
72		179848	Boot, Positive Output Stud	1
73		180735	Washer, Output Stud	1
			Windtunnel, Top Assy (Includes)	1
74		234280	Baffle, Windtunnel	1
75		233476	Windtunnel, Top	1
76		233489	Bracket, Capacitor Support	1
77		216366	Bushing, Snap−In Nyl .500 ID x .625 Mtg Hole	1
		170647	Bushing, Snap−In Nyl 1.312 ID x 1.500 Mtg Hole	2
		057358	Bushing, Snap−In Nyl 1.000 ID x 1.375 Mtg Hole	1
		216596	Strap, Grounding 4.50 in Long	1
78		233485	Panel, Side LH	1
79		179310	Label, Warning General Precautionary Static	2

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-1. Main Assembly (Continued)

. . . 80		233483	. . Cover, Top	1
. . . 81		233488	. . Frame, Lifting	1
. . . 82		026627	. . Gasket, Lifting Eye Cover	1
. . . . .		247632	. . Bracket, Mtg Circuit Cards Assy (Includes)	1
. . . 83 . . .	PC9 . .	244465	. . . . Circuit Card Assy, Secondary Gate Driver	1
. . . 84		248768	. . . . Bracket, Mtg Circuit Cards	1
. . . 85 . . .	PC1 . .	244428	. . . . Circuit Card Assy, Process Control w/Program	1
. . . 86 . . .	PC2 . .	247630	. . . . Circuit Card Assy, Inverter Control w/Program	1
. . . . .		198122	. . . . Stand−Off Support, PC Card .250 w/Post&Lock	10
. . . 87		236299	. . Choke, Common Mode	1
. . . . .		236770	. . Bracket, Mtg Xfmr Assy (Includes)	1
. . . 88		233478	. . . . Bracket, Mtg Xfmr	1
. . . 89		198122	. . . . Stand−Off Support, PC Card .250 w/Post&Lock	4
. . . 90 . . .	PC5 . .	244452	. . . . Circuit Card Assy, HF Arc Starter	1
. . . 91	T2 . .	247619	. . Xfmr, Control 380/400 VAC Pri 1589VA 50/60 Hz	1
. . . 92		057358	. . Bushing, Snap−In Nyl 1.000 ID x 1.375 Mtg Hole	1
. . . 93 .	C7,8,11	236678	. . Capacitor Assy	3
. . . 94	C15,16,17	247825	. . Capacitor Assy	3
. . . 95 . . .	FM3 . .	183918	. . Fan, Muffin	1
. . . 96		253334	. . Grommet, Rbr 1.000 ID x 1.375 Mtg Hole .063 Groove	1
. . . 97		233491	. . Bus Bar, Output	1
. . . 98 . .	PC11 .	231563	. . Circuit Card Assy, Input Filter	1
. . . 99		253764	. . Bracket, Mtg Filter Board	1
. . 100		254572	. . Insulator, Side Panel CE	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*

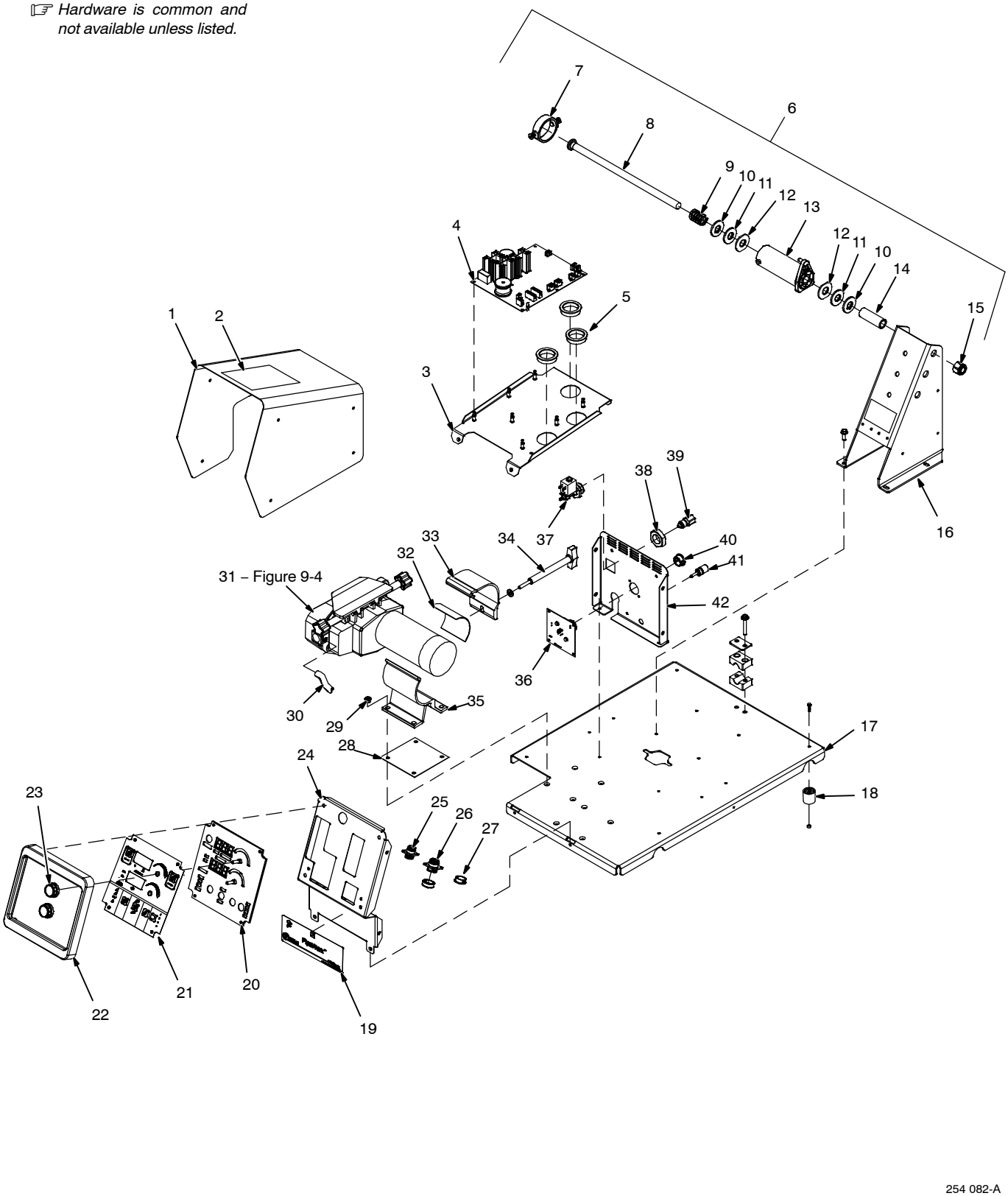


Figure 9-2. Single Wire Feeder

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-2. Single Wire Feeder

1		+234243	Wrapper, Single Feeder	1
2		179310	Label, Warning General Precautionary Static&Wire Fe	1
			Panel Assy, PCB Support (Includes)	1
3		236556	Panel, PC Board Support	1
		198122	Stand−Off Support, PC Card .250 w/Post&Lock .500	7
4	PC1	244483	Circuit Card Assy, Pipeworx Feeder Mtr Ctrl	1
5		010494	Bushing, Snap−In Nyl 1.375 ID x 1.750 Mtg Hole	3
6		143160	Hub+Spindle Assy	1
7		058427	Ring, Retaining Spool	1
8		180573	Shaft Assy, Support Spool	1
9		010233	Spring, CPRSN .970 OD x .120 Wire x 1.250 Pld	1
10		057971	Washer, Flat .632 ID x1.500 OD x.125t Stl Pld .175key	2
11		010191	Washer, Flat .656 ID x1.500 OD x.125t Fbr	2
12		058628	Washer, Brake Stl	2
13		058428	Hub, Spool	1
14		071730	Tubing, Stl .875 OD x12ga Wall x 2.500	1
15		135205	Nut, 625−11 .94hex .77h Stl Pld Elastic Stop Nut	1
16		200556	Support, Spool	1
17		233559	Base, Feeder w/Pem Nuts	1
18		134306	Foot, Rubber 1.250 Dia x 1.375 High No 10 Screw	4
19		254049	Label, Single Feeder Lower	1
			Panel, Front w/Cmpnts Single Bench Feeder (Includes)	1
20	PC2	*246618	Circuit Card Assy, UI w/Program Feeder	1
21		252622	Overlay, Single Feeder	1
22		234501	Bezel, Feeder	1
23		213134	Knob, Encoder 1.670 Dia x .250 ID Push On w/Spring	2
24		233560	Panel, Front	1
25			Plug Assy, Trigger LH (Includes)	1
	PLG17	115093	Housing Plug+Skts,(Service Kit)	1
	RC2	048282	Rcpt w/Skts, (Service Kit)	1
26			Plug Assy, Remote (Includes)	1
	RC4	222857	Housing Plug+Skts, (Service Kit)	1
	PLG35	115093	Housing Plug+Skts, (Service Kit)	1
		200822	Housing Plug+Pins, (Service Kit)	1
27		000527	Blank, Snap−In Nyl .875 Mtg Hole Black	1
28		159647	Insulator, Motor Clamp	1
29		159360	Insulator, Screw Machine	4
30		125473	Hose, SAE .187 ID x .410 OD x 27.000	1
31		201762	Drive Assy, Wire S/L 4 Roll w/Tach	1
32		145639	Strip, Buna−N .062 x 3.000 x 4.000 Compressed Sht	1
33		156243	Clamp, Motor Top	1
34		234426	Knob, w/Extension (LH) Clamp	1
35		159646	Clamp, Motor Base	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

*When ordering PC2 UI circuit card w/program, a single feeder overlay must also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Rear Panel Assy, Single Feeder (Includes)	1
36	PC3	244471	Circuit Card Assy, PS/Feeder Interface	1
37	GS1	228036	Valve, 24VAC 1way .750−14 Thd 2.0mm Orf 100 PSI	1
38		220805	Nut, 750−14 NPS 1.48hex .41h Nyl	1
39		211989	Fitting, w/Screen	1
40		030170	Bushing, Snap−In Nyl .750 ID x 1.000 Mtg Hole	2
41		239737	Receptacle, Banana Jack Blk 10−32 Binding Post	1
42		238498	Enclosure, Rear Single Feeder	1
		074481	Label, Left	1
		254054	Label, To Power Source	1
		287140	Label, Volt Sense	1

Figure 9-2. Single Wire Feeder (Continued)

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*

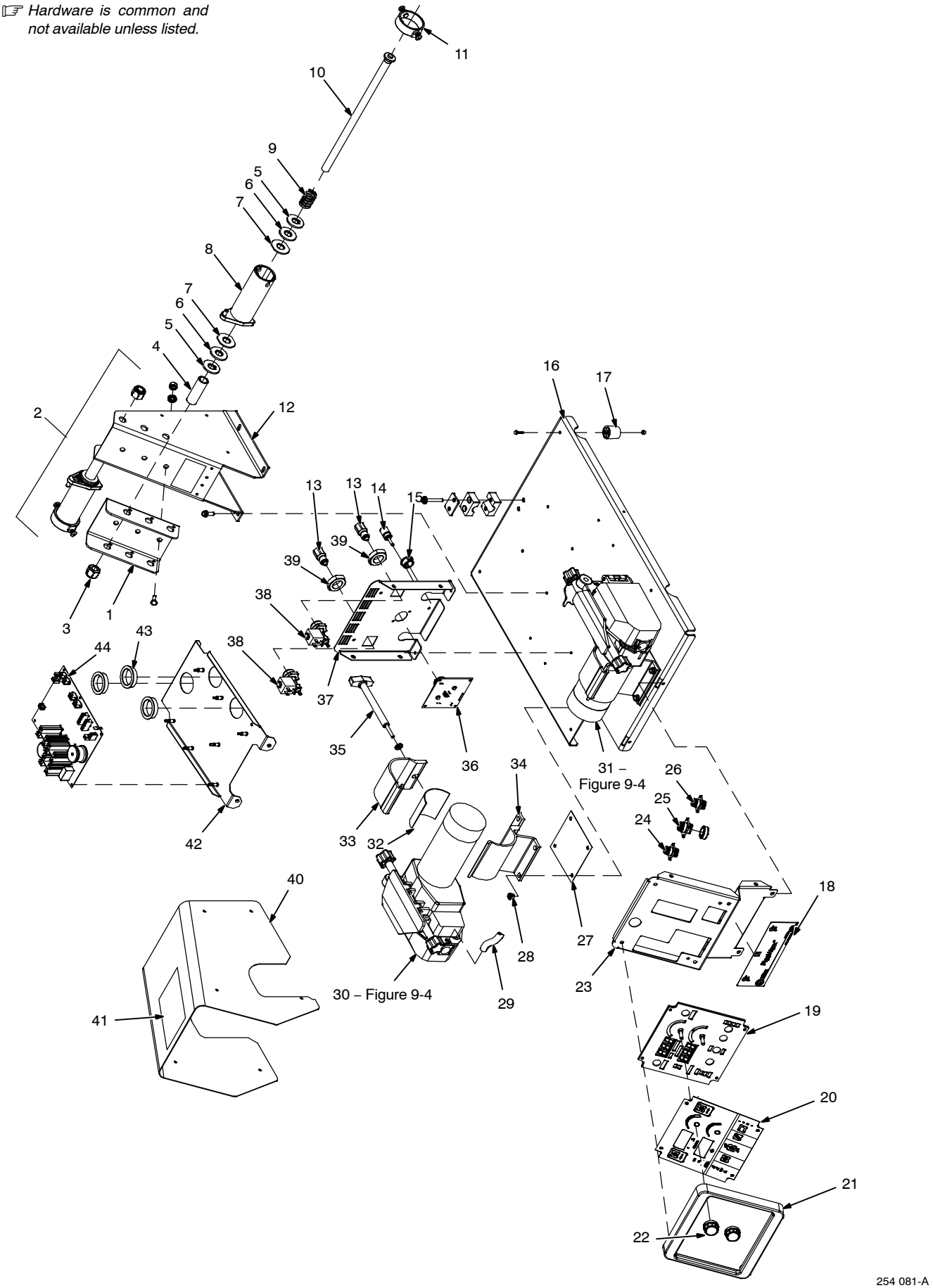


Figure 9-3. Dual Wire Feeder

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-3. Dual Wire Feeder

1		142838	Bracket, Mtg Spool RH	1
2		143160	Hub+Spindle Assy	2
3		135205	Nut, 625−11 .94hex .77h Stl Pld Elastic Stop Nut	2
4		071730	Tubing, Stl .875 OD x 12ga Wall x 2.500	2
5		057971	Washer, Flat .632 ID x 1.500 OD x.125t Stl Pld .175key	4
6		010191	Washer, Flat .656 ID x1.500 OD x.125t Fbr	4
7		058628	Washer, Brake Stl	4
8		058428	Hub, Spool	2
9		010233	Spring, CPRSN .970 OD x .120 Wire x 1.250 Pld	2
10		180573	Shaft Assy, Support Spool	2
11		058427	Ring, Retaining Spool	2
12		141411	Support, Spool	1
13		211989	Fitting, w/Screen	2
14		239737	Receptacle, Banana Jack Blk 10−32 Binding Post	1
15		030170	Bushing, Snap−In Nyl .750 ID x 1.000 Mtg Hole	2
16		233559	Base, Feeder w/Pem Nuts	1
17		134306	Foot, Rubber 1.250 Dia x 1.375 High No 10 Screw	4
18		254048	Label, Dual Feeder Lower	1
			Panel, Front w/Cmpnts Dual Bench Feeder (Includes)	1
19	PC2	*246618	Circuit Card Assy, UI w/Program	1
20		252620	Overlay, Feeder	1
21		234501	Bezel, Feeder	1
22		213134	Knob, Encoder 1.670 Dia x .250 ID Push On w/Spring	2
23		233560	Panel, Front	1
24			Plug Assy, Trigger LH (Includes)	1
	PLG17	115093	Housing Plug+Skts, (Service Kit)	1
	RC2	048282	Rcpt w/Skts, (Service Kit)	1
25			Plug Assy, Remote (Includes)	1
	RC4	222857	Housing Plug+Skts, (Service Kit)	1
	PLG35	115093	Housing Plug+Skts, (Service Kit)	1
		200822	Housing Plug+Pins, (Service Kit)	1
26			Plug Assy, Trigger RH (Includes)	1
	L 2	213030	Core, Toroidal 19.00mm ID x 29.01mm OD x 7.62mm Th	1
	PLG16	115093	Housing Plug+Skts, (Service Kit)	1
	RC3	048282	Rcpt w/Skts, (Service Kit)	1
27		159647	Insulator, Motor Clamp	2
28		159360	Insulator, Screw Machine	8
29		125473	Hose, SAE .187 ID x .410 OD x 27.000	2
30		201762	Drive Assy, Wire S/L 4 Roll w/Tach	1
31		201768	Drive Assy, Wire R 4 Roll w/Tach	1
32		145639	Strip, Buna−N .062 x 3.000 x 4.000 Compressed Sht	2
33		156243	Clamp, Motor Top	2
34		159646	Clamp, Motor Base	2
35		234424	Knob, w/Extension (RH) Clamp	1
35		234426	Knob, w/Extension (LH) Clamp	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

*When ordering PC2 UI circuit card w/program, a dual feeder overlay must also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 9-3. Dual Wire Feeder (Continued)	
. . . . .			Rear Panel Assy, Dual Feeder (Includes)	1
. . . 36 . . .	PC3 . .	244471	. . . . Circuit Card Assy, PS/Feeder Interface	1
. . . 37		233561	. . . . Enclosure, Rear Dual Feeder	1
. . . 38 . .	GS 1, GS 2 .	228036	. . . . Valve, 24VAC 1 way .750−14 Thd 2.0mm Orf 100 PSI	2
. . . 39		220805	. . . . Nut, 750−14 NPS 1.48 hex .41h Nyl	2
. . . . .		074479	. . Label, Right	1
. . . . .		074481	. . Label, Left	1
. . . . .		254054	. . Label, To Power Source	1
. . . . .		287140	. . Label, Volt Sense	1
. . . 40		+233562	. . Wrapper, Dual Feeder	1
. . . 41		179310	. . Label, Warning General Precautionary Static&Wire Fe	1
. . . . .			Panel Assy, PCB Support (Includes)	1
. . . 42		236556	. . . . Panel, PC Board Support	1
. . . . .		198122	. . . . Stand−Off Support, PC Card .250 w/Post&Lock .500	7
. . . 43		010494	. . . . Bushing, Snap−In Nyl 1.375 ID x 1.750 Mtg Hole	3
. . . 44 . . .	PC1 . .	244483	. . . . Circuit Card Assy, Pipeworx Feeder Mtr Ctrl	1
. . . . .		237210	. . Hose Assy, Gas Y	1
. . . . .		143838	. . Cable, Weld 26 in 4/0 w/Terms	1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*

See Table 9-1 For Drive Roll & Wire Guide Kits

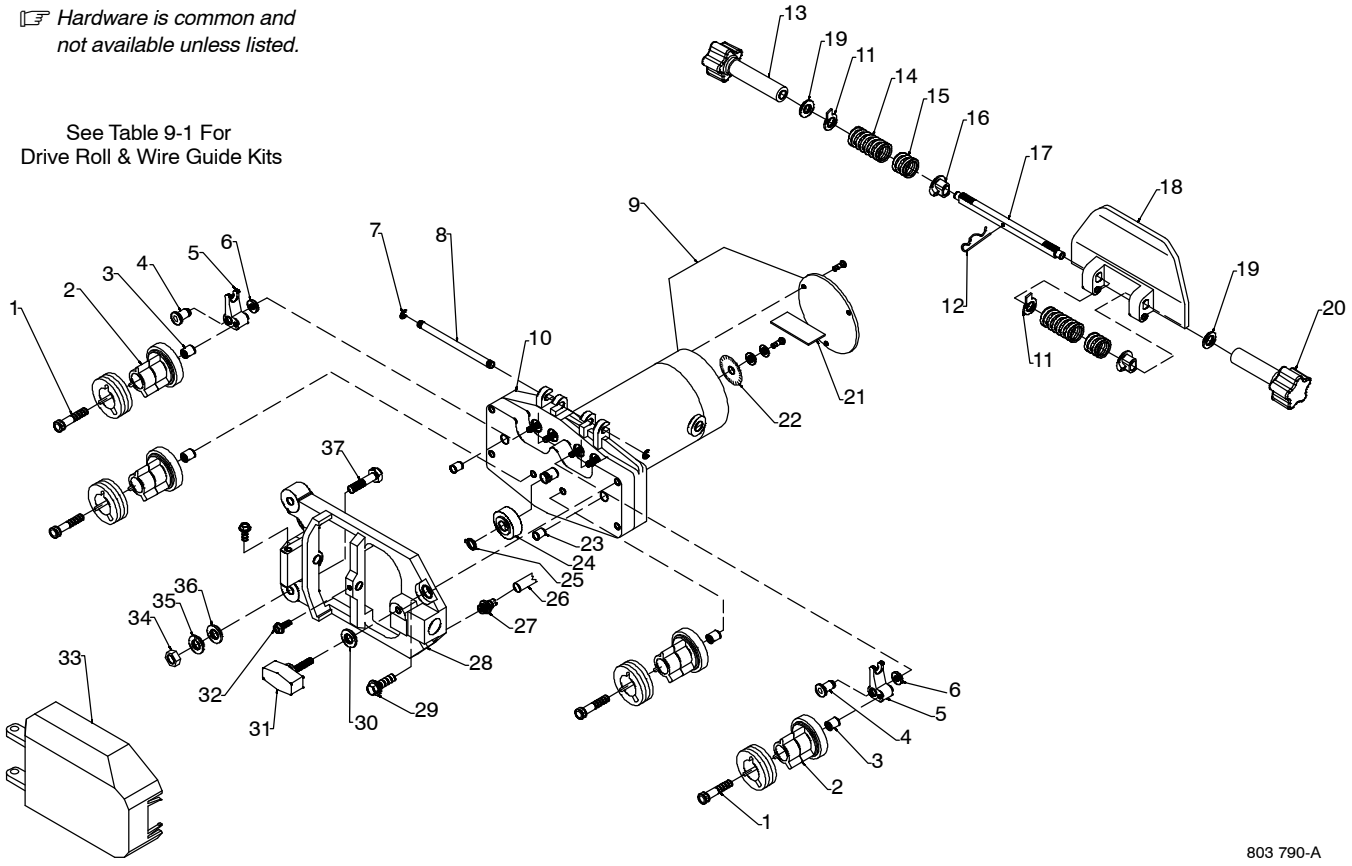


Figure 9-4. Drive Assembly, Wire

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 9-4. Drive Assembly, Wire (Figure 9-2 Item 31 And Figure 9-3 Items 30 And 31)	
1		010 668	Screw, Cap Stl Sch .250-20 x 1.500	4
2		172 075	Carrier, Drive Roll w/Components	4
3		149 962	Spacer, Carrier Drive Roll	4
4		149 486	Pin, Rotation Arm Rocker	2
5		132 750	Arm, Pressure	2
6		150 520	Spacer, Flat Stl .257 ID x .619 OD x .105	2
7		133 493	Ring, Retaining Ext .250 Shaft x .025thk	2
8		133 350	Pin, Hinge	1
9	M1,101	201 230	Motor, Gear 1/8hp 24VDC Standard Speed	1
		153 491	Kit, Brush Replacement (Includes)	1
		153 492	Cap, Brush	2
		*153 493	Brush, Carbon	2
		184 136	Kit, Brush Holder Replacement	1
10		155 098	Kit, Cover Motor Gearbox (Includes)	1
		153 550	Cover, Motor Gearbox (Includes)	1
		155 099	Gasket, Cover	1
		155 100	Screw, Cover	5
		154 031	Spacer, Locating	2
		133 493	Ring, Rtng Ext .250 Shaft Grv x .025thk	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-4. Drive Assembly, Wire (Continued)

. . . . .		203 642	. . Pressure Arm, R & Vert L 4 Roll (Includes)	1
. . . . .		203 631	. . Pressure Arm, S/L & Vert S/R 4 Roll (Includes)	1
. . . 11		203 641	. . . . Washer, Flat Indicator Spring Tension	2
. . . 12		182 415	. . . . Pin, Cotter Hair	1
. . . 13		203 640	. . . . Knob, w/Extension Short Pressure Arm	1
. . . 14		182 156	. . . . Spring, CPRSN	2
. . . 15		182 155	. . . . Spring	2
. . . 16		132 746	. . . . Bushing, Spring	2
. . . 17		203 633	. . . . Shaft, Spring	1
. . . 18		203 632	. . . . Carrier, Shaft	1
. . . 19		133 739	. . . . Washer, Flat Buna .375 ID x .625 OD x .062Thk	2
. . . 20		203 637	. . . . Knob, w/Extension Long Pressure Arm	1
. . . 21 . .	PC51,151 . . .	237 048	. . Circuit Card Assy, Digital Tach (Includes)	2
. . . . .	PLG5	131 204	. . . . Connector & Sockets	1
. . . . .		604 311	. . . . Grommet, Rbr .250 ID x .375 Mtg Hole .062 Groove	1
. . . 22		132 611	. . Optical Encoder Disc	1
. . . . .		603 115	. . Weather Stripping, Adh .125 x .375	1
. . . 23		167 387	. . Spacer, Locating	2
. . . 24		168 825	. . Drive, Pinion	1
. . . 25		133 308	. . Ring, Retaining Ext .375 Shaft x .025Thk	1
. . . 26		134 834	. . Hose, SAE .187 ID x .410 OD (order by ft)	2 ft (0.6 m)
. . . 27		149 959	. . Fitting, Brs Barbed M 3/16Tbg x .312-24	1
. . . 28		179 265	. . Adapter, Gun/Feeder LH	1
. . . 28		179 264	. . Adapter, Gun/Feeder RH	1
. . . 29		108 940	. . Screw, Cap Stl Hexhd .250-20 x .750	4
. . . 30		604 538	. . Washer, Flat Stl SAE .312	1
. . . 31		151 437	. . Knob, Plstc T 1.125 Lg x .312-18 x 1.500	1
. . . 32		151 290	. . Screw, Mach Stl Hexwhd 10-32 x .500	2
. . . 33		179 277	. . Cover, Drive Roll (Includes)	1
. . . . .		178 937	. . . . Label, Warning Electric Shock	1
. . . 34		601 872	. . Nut, Stl Hex Full Fnsh .375-16	1
. . . 35		602 213	. . Washer, Lock Stl Split .375	1
. . . 36		602 243	. . Washer, Flat Stl Std .375	1
. . . 37		601 966	. . Screw, Cap Stl Hexhd .375-16 x 1.250	1

*Recommended Spare Parts.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Table 9-1. Drive Roll And Wire Guide Kits

Wire Size		Inlet Guide	Intermediate Guide	V-GROOVE		VK-GROOVE	
Fraction	Metric			4 Roll Kit	Drive Roll	4 Roll Kit	Drive Roll
.035 in.	0.9 mm	150 993	149 518	151 026	053 700	151 052	132 958
.040 in.	1.0 mm	150 993	149 518	161 189	053 696		
.045 in.	1.1/1.2 mm	150 994	149 519	151 027	053 697	151 053	132 957
.052 in.	1.3/1.4 mm	150 994	149 519	151 028	053 698	151 054	132 956
1/16 in. (.062 in.)	1.6 mm	150 995	149 520	151 029	053 699	151 055	132 955
.068-.072 in.	1.8 mm	150 995	149 520			151 056	132 959
5/64 in. (.079 in.)	2.0 mm	150 995	149 520			151 057	132 960
3/32 in. (.094 in.)	2.4 mm	150 996	149 521			151 058	132 961
Each Kit Contains An Inlet Guide, Intermediate Guide, And 045 233 Antiwear Guide With 604 612 Setscrew 8-32 x .125, Along With 4 Drive Rolls.							

☞ *Hardware is common and not available unless listed.*

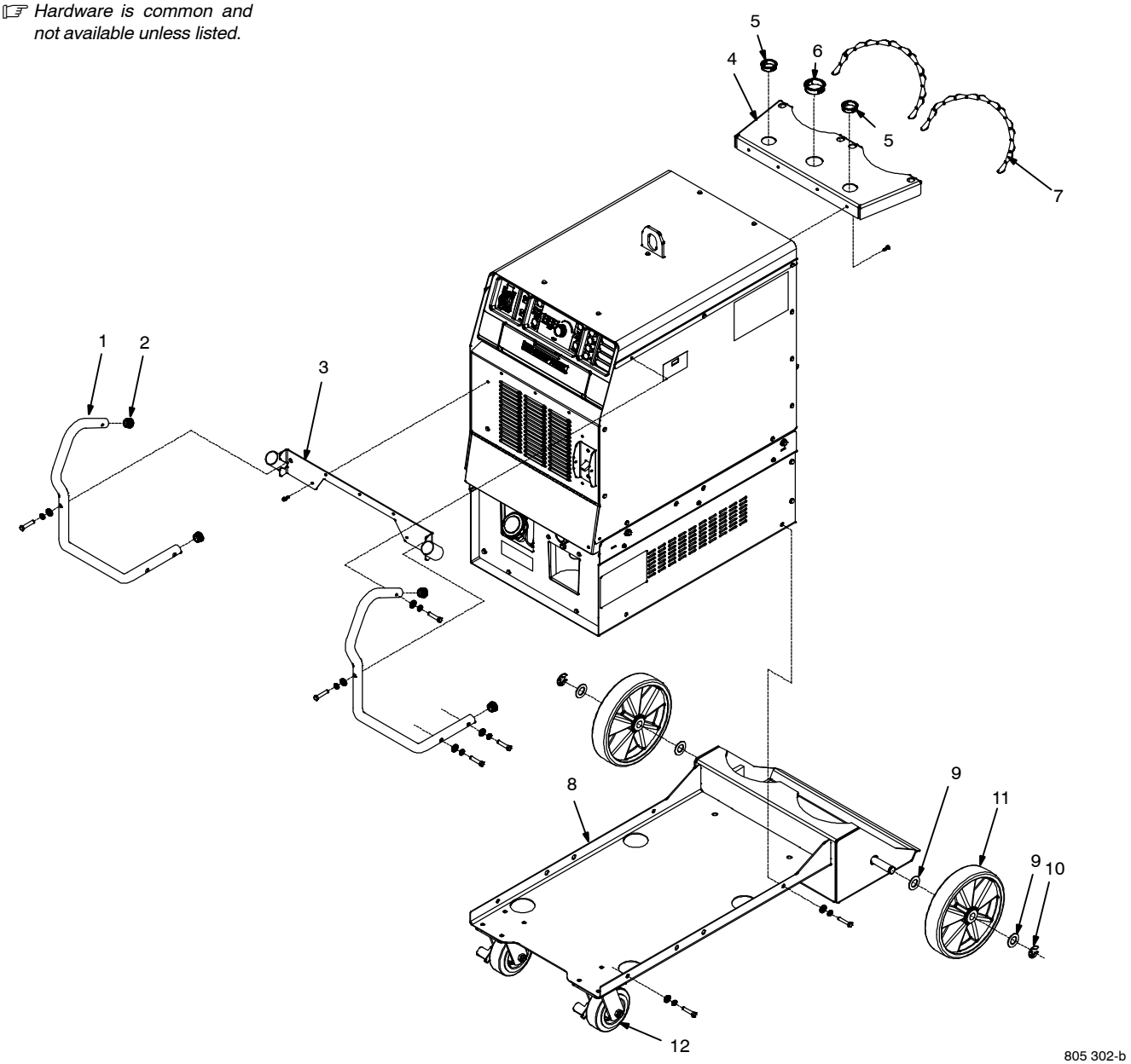


Figure 9-5. Running Gear

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

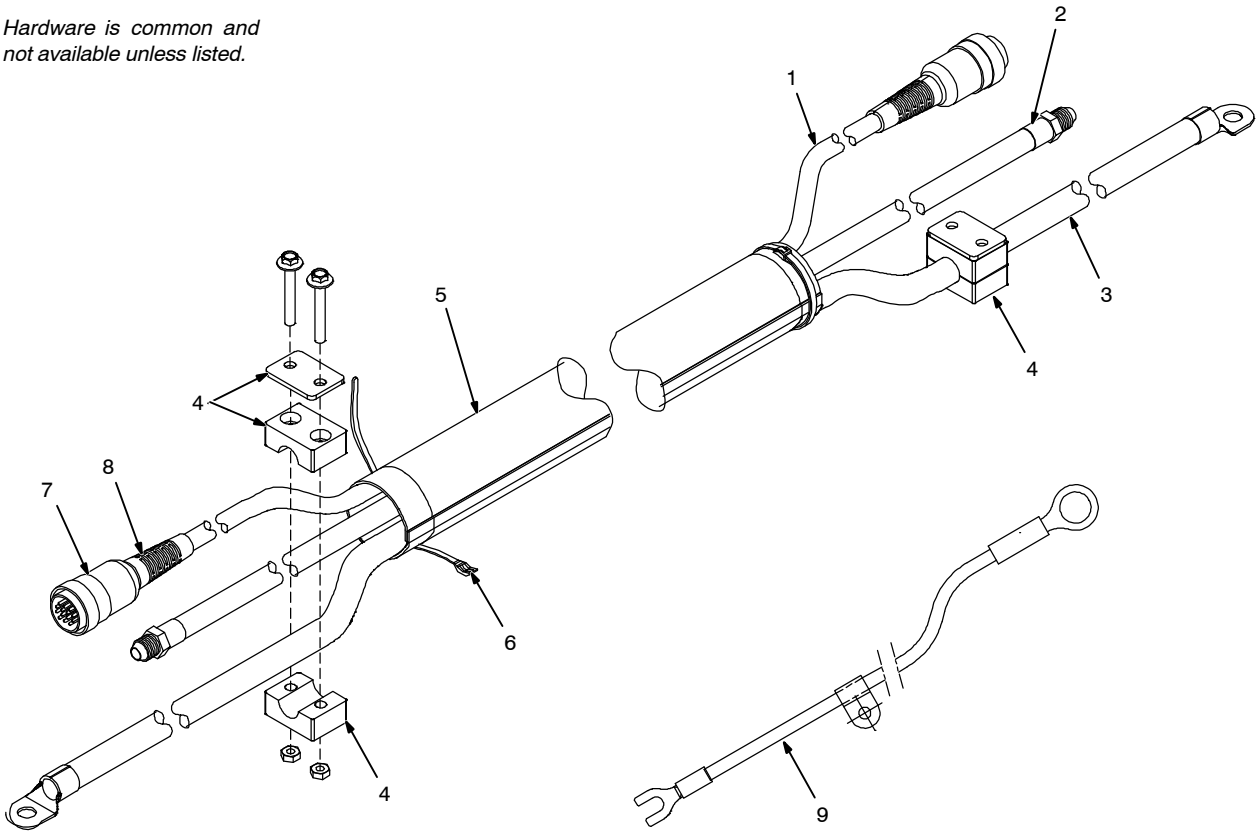
Figure 9-5. Running Gear

1		236827	Handle, Power Source	2
2		238611	Cap, Tube .865 OD	4
3		236817	Handle, Gun Holder Assy	1
4		+233666	Bracket, Support Cylinder Dual	1
		200285	Label, Warning Cylinder May Explode If Damaged	1
5		170647	Bushing, Snap−In Nyl 1.312 ID x 1.500 Mtg Hole	2
6		004214	Bushing, Snap−In Nyl 1.625 ID x 2.000 Mtg Hole	1
7		188441	Chain, Weldless 2/0 x 31. Bright Zinc Pld	2
8		234359	Rack Wheel Assy, Running Gear	1
9		602250	Washer, Flat .812 ID x 1.469 OD x .134t Stl Pld ANSI.750	4
10		121614	Ring, Rtng Ext .750 Shaft x .085 Thk E Style Pld	2
11		163463	Wheel, Rbr Tire 10.000 OD x 2.000 Wide x .750 Bore	2
12		209479	Caster, Swvl 5.00 in Urethane w/Brake 2.000 in Wide	2

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*



805 301-A / Ref. 239 780-B

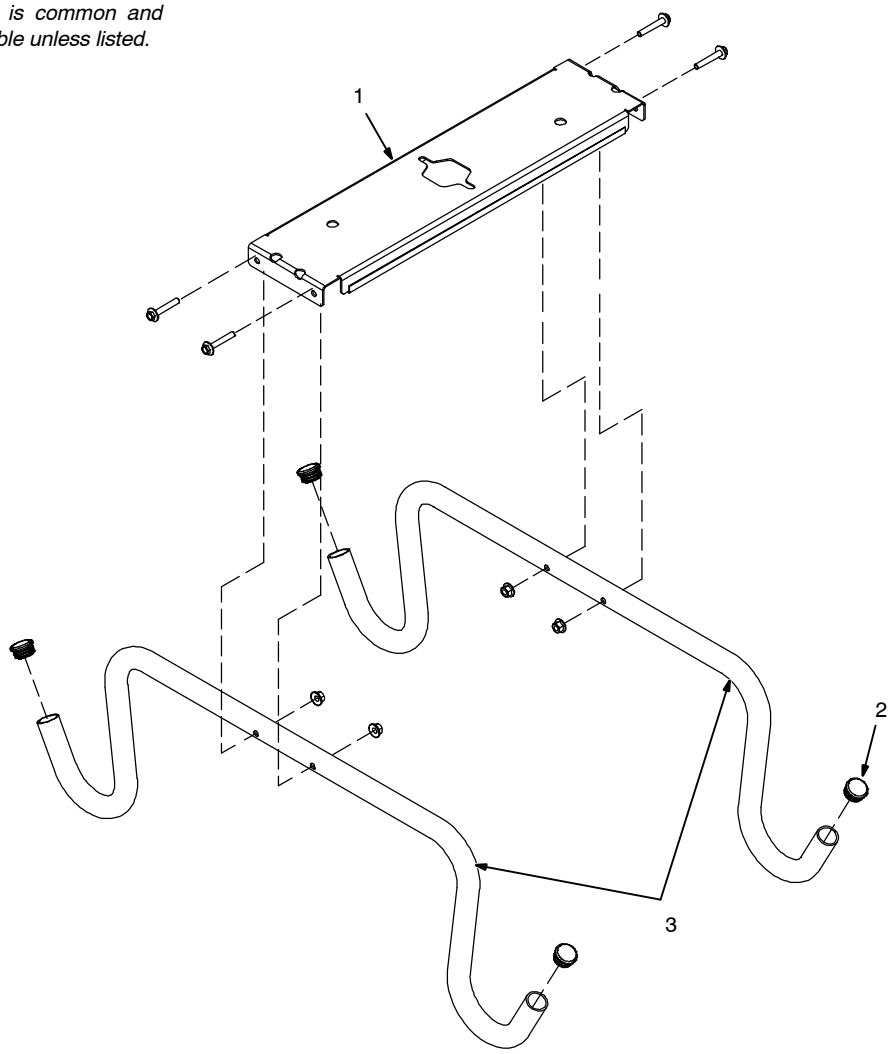
Figure 9-6. Composite Cables

Item No.	Dia. Mkgs.	Part No.	Description	Quantity Model 5 ft 300 367	Quantity Model 25 ft 300 454	Quantity Model 50 ft 300 456
Figure 9-6. Composite Cables						
1		300508	Cable, Interconnecting 5 ft	1		
1		300465	Cable, Interconnecting 31 ft		1	
1		300466	Cable, Interconnecting 56 ft			1
2		238108	Hose Assy, Gas 33 ft		1	
2		238109	Hose Assy, Gas 58 ft			1
3		238110	Cable, Weld 4.5 ft 2/0 w/Terms	1		
3		238111	Cable, Weld 31 ft 2/0 w/Terms		1	
3		238112	Cable, Weld 56 ft 2/0 w/Terms			1
4		238432	Clamp, Strain Relief	2	2	2
5		238263	Cover, Cable 28 ft (Black)		1	
5		238264	Cover, Cable 53 ft (Black)			1
6		210253	Cable Tie, 0–1.750 Bundle Dia	2	2	2
7		047636	Housing Plug + Pins, (Service Kit)	2	2	2
8		143922	Conn, Circ Cpc Clamp Str Rlf	2	2	2
9		300461	Cable, Volt Sense	1	1	
9		300462	Cable, Volt Sense			1

+When ordering a component originally displaying a precautionary label, the label should also be ordered.

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*



805 148-B

Figure 9-7. Cable Hanger Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
1		285304	Bracket, Cable Holder w/Edge Trim	1
2		238611	Cap, Tube .865 OD	4
3		236826	Tube, Cable Holder	2

Figure 9-7. Cable Hanger Assembly

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

☞ *Hardware is common and not available unless listed.*

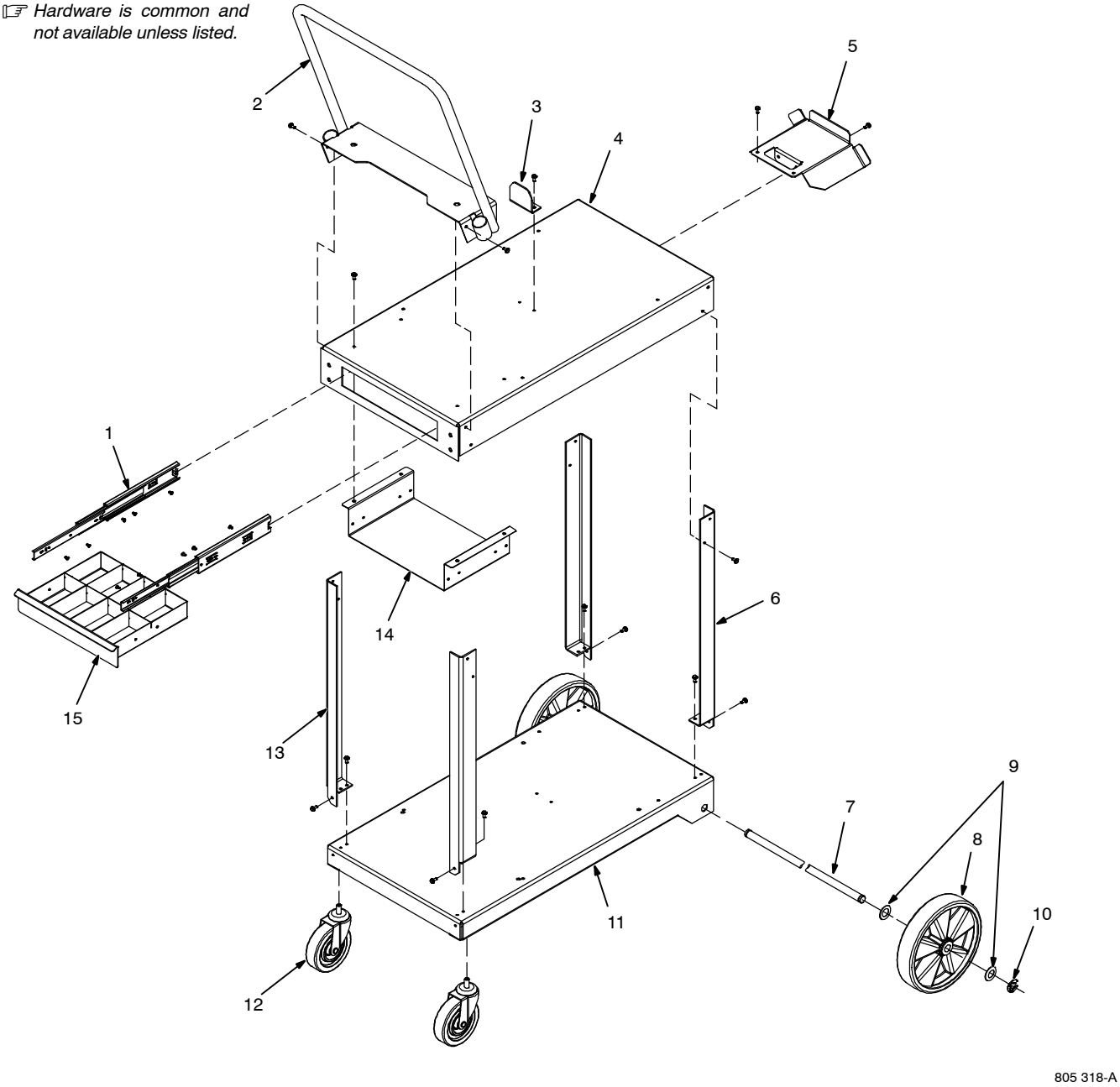


Figure 9-8. Feeder Cart

Item No.	Dia. Mkgs.	Part No.	Description	Quantity

Figure 9-8. Feeder Cart

1		217255	Slide, Drawer	2
2		234505	Handle Assy, Feeder Cart	1
3		234546	Tab, Lift Slot	1
4		234554	Shelf, Upper, Feeder Cart	1
5		235121	Holder, Cable Gun	1
6		234556	Leg, Rear Rh Cart	2
7		234553	Axle, Cart	1
8		163463	Wheel, Rbr Tire 10.000 OD x 2.000 Wide x .750 Bore	2
9		602250	Washer, Flat .812 ID x 1.469 OD x .134t Stl Pld	4
10		121614	Ring, Rtng Ext .750 Shaft x .085 Thk E Style Pld	2
11		234545	Shelf, Lower, Feeder Cart	1
12		123557	Caster, Swvl 5.00 in Polyolefin x 1.375 x .437–14	2
13		234555	Leg, Rear LH Cart	2
14		237215	Bracket, Drawer LH	1
15		232470	Drawer, Assy	1

To maintain the factory original performance of your equipment, use only Manufacturer's Suggested Replacement Parts. Model and serial number required when ordering parts from your local distributor.

Warranty Questions?

Call
1-800-4-A-MILLER
for your local
Miller distributor.

Your distributor also gives you ...

Service
You always get the fast, reliable response you need. Most replacement parts can be in your hands in 24 hours.

Support
Need fast answers to the tough welding questions? Contact your distributor. The expertise of the distributor and Miller is there to help you, every step of the way.

Miller

TRUE BLUE® WARRANTY

Effective January 1, 2012
(Equipment with a serial number preface of MC or newer)

This limited warranty supersedes all previous Miller warranties and is exclusive with no other guarantees or warranties expressed or implied.

LIMITED WARRANTY – Subject to the terms and conditions below, Miller Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new Miller equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by Miller. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, Miller will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. Miller must be notified in writing within thirty (30) days of such defect or failure, at which time Miller will provide instructions on the warranty claim procedures to be followed.

Miller shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the delivery date of the equipment to the original end-user purchaser, and not to exceed one year after the equipment is shipped to a North American distributor or eighteen months after the equipment is shipped to an International distributor.

1. 5 Years Parts — 3 Years Labor
   * Original Main Power Rectifiers Only to Include SCRs, Diodes, and Discrete Rectifier Modules
2. 3 Years — Parts and Labor
   * Engine Driven Welding Generators **(NOTE: Engines are Warranted Separately by the Engine Manufacturer.)**
   * Inverter Power Sources (Unless Otherwise Stated)
   * Plasma Arc Cutting Power Sources
   * Process Controllers
   * Semi-Automatic and Automatic Wire Feeders
   * Smith 30 Series Flowgauge and Flowmeter Regulators (No Labor)
   * Transformer/Rectifier Power Sources
   * Water Coolant Systems (Integrated)
3. 2 Years — Parts
   * Auto-Darkening Helmet Lenses (No Labor)
4. 1 Year — Parts and Labor Unless Specified
   * Automatic Motion Devices
   * CoolBelt and CoolBand Blower Unit (No Labor)
   * External Monitoring Equipment and Sensors
   * Field Options (NOTE: Field options are covered for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
   * Flowgauge and Flowmeter Regulators (No Labor)
   * RFCS Foot Controls (Except RFCS-RJ45)
   * Fume Extractors
   * HF Units
   * ICE/XT Plasma Cutting Torches (No Labor)
   * Induction Heating Power Sources, Coolers **(NOTE: Digital Recorders are Warranted Separately by the Manufacturer.)**
   * Load Banks
   * Motor Driven Guns (w/exception of Spoolmate Spoolguns)
   * PAPR Blower Unit (No Labor)
   * Positioners and Controllers
   * Racks
   * Running Gear/Trailers
   * Spot Welders
   * Subarc Wire Drive Assemblies
   * Water Coolant Systems (Non-Integrated)
   * Weldcraft-Branded TIG Torches (No Labor)
   * Wireless Remote Foot/Hand Controls and Receivers
   * Work Stations/Weld Tables (No Labor)
5. 6 Months — Parts
   * Batteries
   * Bernard Guns (No Labor)
   * Tregaskiss Guns (No Labor)
6. 90 Days — Parts
   * Accessory (Kits)
   * Canvas Covers
   * Induction Heating Coils and Blankets, Cables, and Non-Electronic Controls
   * M-Guns
   * MIG Guns and Subarc (SAW) Guns
   * Remote Controls and RFCS-RJ45
   * Replacement Parts (No labor)
   * Roughneck Guns
   * Spoolmate Spoolguns

Miller's True Blue® Limited Warranty shall not apply to:

1. **Consumable components; such as contact tips, cutting nozzles, contactors, brushes, relays, work station table tops and welding curtains, or parts that fail due to normal wear. (Exception: brushes and relays are covered on all engine-driven products.)**
2. Items furnished by Miller, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
3. Equipment that has been modified by any party other than Miller, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at Miller's option: (1) repair; or (2) replacement; or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Miller's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at a Miller authorized service facility as determined by Miller. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY WHICH, BUT FOR THIS PROVISION, MIGHT ARISE BY IMPLICATION, OPERATION OF LAW, CUSTOM OF TRADE OR COURSE OF DEALING, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may vary from province to province.

Owner's Record

Please complete and retain with your personal records.

Model Name	Serial/Style Number
Purchase Date	(Date which equipment was delivered to original customer.)
Distributor	
Address	
City	
State	Zip

For Service

Contact a DISTRIBUTOR or SERVICE AGENCY near you.

Always provide Model Name and Serial/Style Number.

Contact your Distributor for:	Welding Supplies and Consumables Options and Accessories Personal Safety Equipment Service and Repair Replacement Parts Training (Schools, Videos, Books) Technical Manuals (Servicing Information and Parts) Circuit Diagrams Welding Process Handbooks To locate a Distributor or Service Agency visit www.millerwelds.com or call 1-800-4-A-Miller
Contact the Delivering Carrier to:	File a claim for loss or damage during shipment. For assistance in filing or settling claims, contact your distributor and/or equipment manufacturer's Transportation Department.

Miller Electric Mfg. Co.
An Illinois Tool Works Company
1635 West Spencer Street
Appleton, WI 54914 USA

International Headquarters–USA
USA Phone: 920-735-4505 Auto-Attended
USA & Canada FAX: 920-735-4134
International FAX: 920-735-4125

For International Locations Visit
www.MillerWelds.com

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